NUCLEAR SCIENCE ABSTRACTS

Volume 11 November 30, 1957 No. 22

GENERAL

RESEARCH PROGRAMS

12634 TID-85(1st Rev.)
Technical Information Service Extension, AEC.
REPORT NUMBER SERIES USED BY THE TECHNICAL INFORMATION SERVICE IN CATALOGING REPORTS. Charlotte F. Chesnut and Frances E. Stratton, comps. Sept. 1957. 115p. $3.00(OTS).

A comprehensive list is presented of all research and development report number series used in cataloging reports located in the files of the Technical Information Service Extension, AEC. An alphabetical list is included for each series, identified in each case with the agency using the series to number the reports which it issues. Also included is an alphabetical list of agencies, with a list for each agency of the codes which it has used in numbering reports. (C.H.)

BIOLOGY AND MEDICINE

12635 CRB-717
Atomic Energy of Canada Ltd. Chalk River Project, Chalk River, Ont.
FAMILY LINKAGE OF VITAL AND HEALTH RECORDS: (1) FOR POPULATION STUDIES OF HEREDITARY INFLUENCES ON HEALTH, (2) FOR VERIFICATION OF STATUS FOR WELFARE PROGRAMMES AND OTHER PURPOSES. H. B. Newcombe, A. P. James, and S. J. Axford. July 1957. 105p. (AECL-470).

Techniques for coordinating information from routine vital and health records are presented. Specific applications are described, relating to social and genetic studies of the health of human populations, and to verifications of the status of individuals in the administration of welfare programs and for other purposes. (auth)

12636
TRACE ELEMENTS IN HUMAN TISSUE. 1. A SEMI-QUANTITATIVE SPECTROGRAPHIC SURVEY. S. R. Stitch (Atomic Energy Research Establishment, Harwell, Didcot, Berks). Biochem. J. (London) 67, 97-103(1957) Sept.

12637
TRACE ELEMENTS IN HUMAN TISSUE. 2. ESTIMATION OF THE CONCENTRATIONS OF STABLE STRONTIUM AND BARIUM IN HUMAN BONE. Eleanor M. Sowden and S. R. Stitch (Atomic Energy Research Establishment, Harwell, Didcot, Berks). Biochem. J. (London) 67, 104-9(1957) Sept.

12638
RADIOACTIVE CONTAMINATION OF CERTAIN AREAS IN THE PACIFIC OCEAN FROM NUCLEAR TESTS. Gordon M. Dunning, ed. Washington, U. S. Atomic Energy Commission, 1957. 60p. Available from U. S. Government Printing Office for $0.40.

The results of the medical and radiological surveys of the Marshall Islands following the thermonuclear test at Eniwetok, March 1, 1954, are presented. In addition to an external gamma radiation survey, the gross activity of land plants, marine organisms and birds, soils, and water was measured. The results of radiochemical analyses of various biological materials are given, and studies of internal contamination of animals, residual activity in the Pacific Ocean, and medical status of the Rongelapese are described. (T.R.H.)

RADIATION EFFECTS

12639 AECU-3504
Massachusetts Inst. of Tech., Cambridge. Radioactivity Center.
RADIUM AND MESOTHORIUM POISONING AND DOSIMETRY AND INSTRUMENTATION TECHNIQUES IN APPLIED RADIOACTIVITY. Annual Progress Report. May 1957. 94p. Contract AT(30-1)-952. $0.50(OTS).

The study of persons containing internal deposits of Ra and Ra decay products was continued with evaluations being made of the radiation dose delivered and correlation of this data with manifestations of toxic effects on the patients. Measurements were made on a total of 13 individuals. Data are tabulated from the results of analysis of teeth and breath specimens of dial painters exposed to Ra. A literature survey disclosed 190 cases of Ra exposure. Proposals are discussed for a central catalog of data on human Ra exposure cases. The contributions of K^{40}, Ra^{226}, Ra^{228}, Pb^{210}, cosmic rays, environmental γ rays, and medical x rays to the low level skeletal irradiation of man are discussed. A survey was made of shielding materials for use in a low γ-background counting room. Data are tabulated. Water and possibly dunite brick were the only substances found to be comparable to steel as shielding materials. Results are included from an investigation of the self-absorption of γ rays. Efforts were made to improve the techniques for the assay of Ra, Rn, Po, and for the radiometric analysis of bone for natural radioactivity. Results are tabulated from the demonstration of Ca^{45} distribution in dog femurs by quantitative autoradiography using a microdensitometer mounted in a camera on the photomicrography tube of a microscope for scanning. The dynamics of Sr and Ca metabolism and removal were studied in dogs connected to either an artificial kidney or ion exchange column following the administration of Sr^{85}, Sr^{89}, and Ca^{45}. Measurements are reported in progress to determine the half-life of Th^{232}. Work was continued on the development of a scintillation-type fast neutron dosimeter based on the cavity principal, the development of a multichannel pulse analyzer, and modifications in an audio-pulse type magnetic tape recorder to record pulses from an ion chamber. A list of publications during the period is included. (For preceding period see AECU-3261.) (C.H.)

12640 AF-SAM-57-84
School of Aviation Medicine, Randolph AFB, Tex. and Texas. Univ., Austin.
RADIATION CREATINURIA IN THE RAT. Clyde M. Williams, George M. Krise, Donald R. Anderson, and Robert M. Dowben. Jan. 24, 1957. 10p.

12641 AF-SAM-57-91
Chicago. Univ. Dept. of Medicine.
LEUKOCYTE COUNT AND SUSCEPTIBILITY TO BAC-

TERIAL INFECTION AS AFFECTED BY CONTINUOUS EXPOSURE TO LOW DOSE GAMMA IRRADIATION. C. Philip Miller and Carolyn W. Hammond. Jan. 31, 1957. 10p.

12642 ANL-5732
Argonne National Lab., Lemont, Ill.
BIOLOGICAL AND MEDICAL RESEARCH DIVISION SEMI-ANNUAL REPORT [FOR] JANUARY THROUGH JUNE 1957. July 1957. 203p. Contract W-31-109-eng-38. $5.50(OTS).

Progress is reported in the following studies: the radiosensitivity of paramecium; the sensitivity of germinating tobacco seed to light and x radiation; characteristics of mutants of Escherichia coli; the toxicity of Sr^{90} in dogs and mice; the effects of whole-body x irradiation on liver catalase levels in mice; the biosynthesis of methionine in bacteria; the effect of irradiation on liver tryptophan peroxidase activity in rats; the dissociation of insulin in pyridene-water and acetic acid-water solutions; the development of devices for dispensing microbal cultures rapidly and for counting bacteria automatically; the effect of 3-amino-1,2,4-triazole on intracellular distribution of catalase and uricase in mice livers; biochemical and morphological studies on nuclei from rat livers; electron microscope observations of the protozoan flagellate, Peranema trichophorum; the initial radiation syndrome of the pigeon and its effect on blood pressure and renal function; amyloid disease in irradiated and nonirradiated mice; genetic variation in the survival time of mice under daily exposures to Co^{60} γ radiation; the acute radiation response of the chick; the toxic effects of deuterium oxide in rats; the deposition of liver glycogen in x-irradiated guinea pigs; the influence of ultraviolet, x, and γ radiations on pigmentation in mice; an analysis of the mechanisms involved in radiation injury; the metabolism of boron by Chlorella; photoperiodism studies on Xanthium; the effect of gibberellic acid and photoperiod on indoleacetic acid oxidase in Lupinus albus; measurements of the neutron spectrum at the animal exposure position within the gamma-neutron radiation chamber at the CP-5 Argonne research reactor; the effect of single and spaced multiple doses of Co^{60} γ and fission neutron radiation on the incorporation of Fe^{59} into the rat hematopoietic system; the effectiveness of three radiation qualities on rats in terms of chronic radiation injury and mortality; the survival of giant amoebae after single exposures to Co^{60} γ rays and fission neutrons; the effects of injection of nonirradiated protoplasm on the recovery of irradiated amoebae; the development of a micropipette cutting device for cytological work; factors affecting granulocyte distribution; the effectiveness of injected solutions of the dipotassium salt of rhodizonic acid (K_2R) and the tetrasodium salt of tetrahydroxyquinone (Na_4T) for increasing the excretion of Sr^{85} in rats; the secretary activity of tissue mast cells; studies on the effect of deuterium oxide on tumor growth in mice; the development of an automatic scanner for the localization of tritiated compounds in paper chromatograms; the effect of neutron irradiation upon anhydrous Na_2HPO_4 and $Na_4P_2O_7$ in quartz, lime, and boron-free glass tubes; the stability toward x rays of sulfonium compounds as illustrated by s-adenosylmethionine; tracer studies employing labeled CO_2 on the kinetics of glycine metabolism in rat liver; the structural elements of uterine muscles; the preparation of tritium-labeled organic compounds by self-irradiation; the metabolism of alkylmercaptans in yeast; the metabolism of unsaturated fatty acids and cholesterol in rats; the biogenesis and translocation in plants of C^{14}-gibberellic acid; and the growth of algae in high concentrations of deuterium oxide. (For preceding period see ANL-5696.) (C.H.)

12643 PB-121925
Stanford Research Inst., Menlo Park, Calif.
FLAVOR CHANGES INDUCED BY RADIATION STERILIZATION. Final Report No. 8 [for] May 19, 1955–June 30, 1956. Fred E. Littman and A. P. Brady. Aug. 6, 1956. 65p. [DA] Project No. 7-84-01-002 and SRI Project No. SU-1386. Contract DA19-129-QM-387.

The flavor changes that occur in food when it is irradiated are presumably caused by the action of free radicals, formed by radiolysis of water, on the food components. In order to obtain a clearer picture of the reactions involved in the production of off-flavors, the action of the individual radicals was studied and compared with results obtained by γ irradiation under similar conditions. A sulfur-containing amino acid—cysteine—and a tripeptide containing cysteine—glutathione—were chosen for initial experimentation. Solutions of cysteine and glutathione were irradiated with γ rays from a Co^{60} source in both the presence and absence of oxygen. A method was devised for the production of hydrogen atoms at pressures up to 20 mm Hg by electrical discharge in fast-flowing mixtures of hydrogen and helium. The characteristics of this source of atomic hydrogen were determined and the systems calibrated. The effects of atomic hydrogen on aqueous solutions of cysteine and glutathione were investigated. The action of atomic hydrogen results in the formation of hydrogen sulfide as well as the corresponding disulfide. The relative reaction rates depend on the pH of the solution. A mechanism which accounts for this dependency has been proposed. (auth)

12644 UCRL-3873
California. Univ., Berkeley. Radiation Lab.
A GENERALIZATION OF TARGET MODELS OF SURVIVAL. Howard G. Parker. July 22, 1957. 25p. Contract W-7405-Eng-48. $0.75(OTS).

A multistage model for the description of biological survival curves is proposed as a possible means of generalizing target and hit theories to provide for interdependence of events. The model includes single- and multiple-hit and multiple-target theories as special cases, emphasizing their similarities and their differences. Its increased flexibility points out the nonunique character of the fit of various current models to data. In addition it provides a simple scheme for holding in mind the current theories and their assumptions. The basic model consists of a series of n discrete stages. The time in each stage is randomly determined on the basis of a frequency k_i which can be set differently for each stage. When all the k's are equal, multihit theory results. An arithmetic progression in the k's gives rise to Kiga's multitarget theory. Alternatively, other untested relationships between the k's can be examined. (auth)

12645 UR-496
Rochester, N. Y. Univ. Atomic Energy Project.
HISTOLOGICAL INVESTIGATIONS OF MECHANISMS OF X-RAY EFFECTS ON SPERMATOGENESIS IN THE RAT. I. INTRODUCTION, PURPOSE, METHODS AND PRELIMINARY EXPERIMENTS. Alison P. Casarett and George W. Casarett. June 3, 1957. 119p. Contract W-7401-eng-49. $3.25(OTS).

12646 UR-497(Pt. II)
Rochester, N. Y. Univ. Atomic Energy Project.
HISTOLOGICAL INVESTIGATIONS OF MECHANISMS OF X-RAY EFFECTS ON SPERMATOGENESIS IN THE RAT. II. STUDIES COMPARING EFFECTS OF ACUTE AND CHRONIC IRRADIATION. Alison P. Casarett and George W. Casarett. June 3, 1957. 135p. Contract W-7401-eng-49. $3.50(OTS).

12647
SHORTENING OF LIFE BY CHRONIC IRRADIATION: THE EXPERIMENTAL FACTS. R. H. Mole (Atomic Energy Research Establishment, Harwell, Berks). Nature 180, 456-60(1957) Sept. 7.

12648
BIOLOGICAL ROLE OF POTASSIUM-40. A. P. Vinogradov (Academy of Sciences, Moscow). Nature 180, 507-8(1957) Sept. 7.

RADIATION HAZARDS AND PROTECTION

12649 AECU-3176
Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.
THE DEVELOPMENT AND OPERATION OF THE NRTS LAUNDRY. John R. Bonnett. Dec. 1, 1955. 12p. Contract AT(10-1)-205. (PTR-21). $3.30(ph OTS); $2.40 (mf OTS).

Equipment lists and operating procedures are presented for a laundry designed to wash contaminated clothing. (C.H.)

12650 K-1344
Oak Ridge Gaseous Diffusion Plant, Tenn.
THE EFFECTS OF URANIUM CONTAMINATION ON LAUNDRY OPERATIONS. J. C. Bailey, S. A. Kingsbury, and J. R. Knight. Sept. 26, 1957. 9p. Contract W-7405-eng-26. $0.50(OTS).

Brief tests were made to determine the degree of uranium cross-contamination between contaminated clothing and noncontaminated clothing when laundered together and when noncontaminated clothing was laundered in the same equipment immediately after contaminated clothing. It was found that noncontaminated items became contaminated to some extent if laundered in the same batch with clothing on which there were insoluble uranium compounds, but that there was essentially no transfer of contamination when the uranium compounds were soluble ones. The laundry equipment did not become contaminated in any case, and thus there was no transfer of uranium to noncontaminated items laundered in the same equipment as the contaminated items, but in separate batches. In these tests approximately 80% of the insoluble uranium compounds and 98% of the soluble compounds were removed. An improved laundry cycle was found to remove about 96.5% of the insoluble compounds, and the use of a sodium-bicarbonate wash solution prior to this wash cycle resulted in the removal of about 99% of the uranium. (auth)

12651 KAPL-1831
Knolls Atomic Power Lab., Schenectady, N. Y.
HEALTH PHYSICS REPORT FOR JANUARY, FEBRUARY, MARCH 1957. 32p. Contract W-31-109-Eng-52. $0.25 (OTS).

Personnel, in-plant, and environmental radiation monitoring procedures engaged in during the period are summarized. (For preceding period see KAPL-1699.) (C.H.)

12652 NRL-5017
Naval Research Lab., Washington, D. C.
RADIATION PROTECTION AFFORDED BY BARRACKS AND UNDERGROUND SHELTERS. C. W. Malich and L. A. Beach. Aug. 22, 1957. 48p. Project NY 340-032.

The shielding properties of standard Navy enlisted men's barracks and underground shelters have been calculated for the gamma radiation associated with fall-out from nuclear weapons. Also the attenuation of prompt radiation from nuclear weapons into underground structures was studied. The major benefit of present barracks is the possibility of the prevention of deposition of radioactive material on personnel. In addition, the gamma-ray dose is reduced about one-half inside the building by keeping the radioactivity outside, and the shielding of the walls gives a further reduction in dose of a factor of two. Excellent protection against fall-out radiations can be provided by underground shelters if entrances and vents are properly designed to minimize leakage. Attenuations of fall-out radiation by underground shelters range from 10^{-4} at 3 ft of minimum thickness of earth cover to 10^{-10} at 10 ft of earth cover. Attenuations of prompt radiation by underground shelters are less, due to more penetrating components, but still provide adequate protection against many attack situations. Attenuations range from 10^{-2} at 3 ft of cover to 10^{-6} at 10 ft of cover. (auth)

12653
MAXIMUM PERMISSIBLE CONCENTRATION OF RADIOISOTOPES. A. Catsch. Atomkern Energie 2, 181-6(1957) May. (In German)

12654
THE INFLUENCE OF ISOTOPIC AND NONISOTOPIC CARRIERS ON THE BEHAVIOR OF Sr^{90} IN THE RAT. A. Catsch. Experientia 13, 312-13(1957). (In German)

Investigating the influence of isotopic or nonisotopic carriers on the behavior of Sr^{90} in the rat, calcium was found to be ineffective, whereas magnesium was essentially more effective in reducing the deposition of Sr^{90} in the skeleton as equimolar amounts of stable strontium. According to these results, neither calcium nor magnesium can act as 'biological' carrier for radiostrontium. (auth)

RADIOTHERAPY

12655 AF-SAM-57-92
Texas. Univ., Houston. M. D. Anderson Hospital; Texas. Univ., Houston. Tumor Inst.; and School of Aviation Medicine, Randolph AFB, Tex.
SYSTEMIC AND CLINICAL EFFECTS INDUCED IN 263 CANCER PATIENTS BY WHOLE-BODY X-IRRADIATION WITH NOMINAL AIR DOSES OF 15 TO 200 R. Lowell S. Miller, Gilbert H. Fletcher, and Herbert B. Gerstner. Feb. 4, 1957. 22p.

TOXICOLOGY STUDIES

12656 TID-3067
Technical Information Service Extension, AEC.
MERCURY TOXICITY: A BIBLIOGRAPHY OF PUBLISHED LITERATURE. Hugh E. Voress and Naomi K. Smelcer, comps. July 1957. 54p. $1.50(OTS).

This title list contains 1676 references to articles on mercury toxicity that have appeared in technical journals from 1903 to the spring of 1955. The references are arranged alphabetically by senior author. (auth)

12657
BERYLLIUM. HAZARD EVALUATION AND CONTROL COVERING A FIVE YEAR STUDY. R. N. Mitchell and E. C. Hyatt (Los Alamos Scientific Lab., N. Mex.). Am. Ind. Hyg. Assoc. Quart. 18, 207-13(1957) Sept.

12658
HAZARD CONTROL IN PROCESSING STAINLESS STEEL AND COPPER CONTAMINATED WITH URANIUM. D. M. Davis, J. C. Hart, and A. D. Warden (Oak Ridge National Lab., Tenn.). Am. Ind. Hyg. Assoc. Quart. 18, 235-41(1957) Sept.

12659
ESTIMATION OF PLUTONIUM LUNG BURDEN BY URINE

ANALYSIS. John W. Healy (General Electric Co., Richland, Wash.). Am. Ind. Hyg. Assoc. Quart. 18, 261-6(1957). Sept.

TRACER APPLICATIONS

12660 HW-46150

General Electric Co. Hanford Atomic Products Operation, Richland, Wash.

THE LONG TERM RETENTION OF CESIUM IN THE RAT FOLLOWING A SINGLE INTRAPERITONEAL INJECTION. J. E. Ballou and R. C. Thompson. Apr. 1, 1957. 16p. Contract W-31-109-Eng-52. $0.20(OTS).

Cesium^{137} is absorbed rapidly and completely by the rat after intraperitoneal injection and is deposited almost entirely in the soft tissues. The largest total quantity and the highest concentration (subsequent to the first day) is found in muscle. Its retention in muscle over a period of 200 days, during which time its concentration is reduced by a factor of nearly 10^5, may be most adequately described as a sum of two exponential components with biological half-lives of 8 and 16 days. In addition to these two components, most other tissues also exhibit a substantial shorter lived component with a half life of approximately two days. Thirty days after exposure about 10% of the injected Cs remains in the animal with 90% of this being present in muscle. For purposes of calculating permissible exposure limits, the rate of loss of Cs from muscle can be quite closely approximated by a single exponential function with a half life of 13 days. Consistent with this half life, the fraction of ingested Cs^{137} deposited in muscle is 0.57. The maximum permissible concentration for Cs^{137} in water, calculated from these parameters is 1.8×10^{-3} μc/ml, which differs insignificantly from the presently accepted value of 2×10^{-3} μc/ml. Attention is called to recent studies indicating a much longer biological half life in man than that observed in the rat. (auth)

12661 UCRL-3848

California. Univ., Berkeley. Radiation Lab.

PHOTOSYNTHESIS. Melvin Calvin. July 1957. 32p. Contract W-7405-eng-48. $1.00(OTS).

The use of tracer carbon, as carbon-14, has made possible considerable progress in the mapping of the routes taken by the carbon atom from CO_2 into plant substances. The techniques of separation and identification that have made this progress possible lie largely in the region of chromatography and radioautography involving fractional gamma amounts of material. Most of the earlier steps of carbon incorporation are now known and will be described. In addition, a number of the later steps on the routes to amino acids and proteins and other plant substances are now under investigation. As a result of the recognition of the earlier stages of carbon incorporation, a number of proposals have been postulated about the photochemical act itself. These proposals have led to the development of direct physical tests of their validity and some results of these will be described. The remaining principal area of investigation involving the route of oxygen atoms from water to molecular oxygen is largely unexplored, but the use of new methods of analyzing for the heavy isotopes of oxygen may make more progress in this area possible. (auth)

CHEMISTRY

12662 BMI-1211

Battelle Memorial Inst., Columbus, Ohio.

A TWO-STAGE MODEL FOR THE SOLID-PHASE BONDING PROCESS. James B. Melehan, Frank C. Holden, Horace R. Ogden, and Robert I. Jaffee. July 29, 1957. 28p. Contract W-7405-eng-92. $1.00(OTS).

The solid-state bonding of simulated single-asperity contacts has been studied, using a gold needle point in contact with a gold flat. The bond strength-time relation at any temperature can be expressed as the sum of three components, of which the first is time independent and corresponds to instantaneous adhesion. The time dependence of the other two terms has been expressed as growth of the bonded area by creep and self-diffusion processes. The rate at which bond strength increases by self-diffusion has been expressed in terms of the equation developed by Kuczynski. In the majority of tests, the growth of the bond by creep was eliminated by conducting the tests at zero load in order to simplify the analytical expression developed for bond growth. (auth)

12663 BNL-3335

Brookhaven National Lab., Upton, N. Y.

DISSOLUTION OF ZIRCONIUM-TYPE FUEL ELEMENTS IN SULFURIC ACID CATALYSED WITH HF. J. J. Reilly, W. H. Regan, R. H. Wiswall, and L. P. Hatch. [1957]. 19p. Contract [AT-30-2-gen-16].

Some experiments relating the rate of dissolution of Zircaloy-2 in H_2SO_4 to temperature, HF concentration, and H_2SO_4 concentration are described. (T.R.H.)

12664 HW-48832

General Electric Co. Hanford Atomic Products Operation, Richland, Wash.

CESIUM PACKAGING STUDIES. CONVERSION OF CESIUM ZINC FERROCYANIDE TO A CESIUM CHLORIDE PRODUCT. J. L. Hepworth, E. D. McClanahan, Jr., and R. L. Moore. June 5, 1957. 28p. Contract W-31-109-Eng-52. $0.25(OTS).

The composition of cesium zinc ferrocyanide was found to be $Cs_2ZnFe(CN)_6$ with one to two waters of hydration, depending on the temperature of drying. The crystal structure is isomorphous with potassium zinc ferrocyanide, being face centered cubic with a cell parameter of 10.2 A and a calculated crystallographic density of about 3.44 gms/cc. It appears that some radiation decomposition occurs when cesium zinc ferrocyanide is exposed to γ radiation from Co^{60} or to 1.9 Mev electrons from a Van de Graaff electrostatic accelerator; however, there is some uncertainty regarding the exact extent of degradation which would result from self-irradiation. A process for the conversion of cesium zinc ferrocyanide to a product containing cesium chloride was developed. The process employs a calcination-chlorination step to convert the cations to chlorides and oxides. The final product was found to be $2CsCl \cdot ZnCl_2 + \frac{1}{2} Fe_2O_3$. A flowsheet is shown describing this process. Explosions were sometimes observed when cesium zinc ferrocyanide was heated, but two washes with water were sufficient to remove the sodium nitrate which caused the explosions. A second process was developed to convert cesium zinc ferrocyanide to a pure cesium chloride product. This process employed a calcination followed by water leaching, acidification with hydrochloric acid, and evaporation to dryness. A flowsheet is appended. A process was developed wherein cesium zinc ferrocyanide is dissolved with hot concentrated sulfuric acid followed by subsequent removal of undesirable ions by sulfide precipitation and anion exchange. The final product again is cesium chloride. A flowsheet is shown describing the process. An alternate process is described using a mercury cathode cell for the reduction and removal of undesirable cations. A flowsheet is shown with cesium chloride as the final product. All except the calcination-leaching process were found to be

equally applicable to cesium-containing nickel ferrocyanide, ferric ferrocyanide, or zinc ferricyanide precipitates. (auth)

12665 IGRL-IB/R-13

United Kingdom Atomic Energy Authority. Industrial Group H. Q., Risley, Lancs, England.

ELECTROLYSIS OF FUSED SALTS. Information Bibliography. B. Yates, comp. Apr. 1956. 16p.

12666 NAA-SR-1925

Atomics International Div., North American Aviation, Inc., Canoga Park, Calif.

BASIC CHEMISTRY OF HIGH TEMPERATURE INORGANIC SYSTEMS. Semiannual Progress Report [for] July–December 1956. S. J. Yosim and T. A. Milne. July 15, 1957. 49p. Contract AT-11-1-GEN-8. $0.45(OTS).

The vapor pressure determination of solid ThF_4 has been completed. The corrected vapor pressure of solid ThF_4 from 1055 to 1297°K is: Log P(atm) = – 16,860/T°K + 9.107. Experiments to determine the heat of formation of ThF_4 by studying the reaction of ThF_4 with SiO_2 are described. A kinetic study of the thermal decomposition of $Th(NO_3)_4$ has been initiated. The results of the Bi–$BiCl_3$ solubility experiments indicate the possibility that the consolute temperature exists at about 775°C. The solubility of Cd in $CdCl_2$ increases with increasing temperature to a value of 24 mole per cent at 963°C. The solubility studies of Hg–Hg_2Cl_2 are also under way. Vapor pressure experiments on bismuth trichloride dissolved in bismuth indicated large positive deviations from Raoult's law. Two series of cryoscopic experiments are described: one in which $HgCl_2$ is the solvent, and one in which molten Bi is the solvent. In order to gain information on the species in molten salts, a study of the transport number in fused salts has begun. A new program has been initiated to examine the nature of ceramics at high temperatures. Knudsen and Langmuir vaporization studies are under way on La_2O_3, BeO, and ZrC. The electron density distribution of BeO is being determined by three-dimensional x-ray-diffraction measurements. Also, an experimental program is under way to seek principles to guide the search for new and superior refractories. (For preceding period see NAA-SR-1797.) (auth)

12667 NAVAER-07-1-505

Bureau of Aeronautics (Navy).

INFORMATION ON TOXICITY, FLASHPOINT, AND FLAMMABILITY OF CHEMICALS USED BY THE BUREAU OF AERONAUTICS. Nov. 1, 1956. 105p.

12668 NP-6424

Shell Development Co., Emeryville, Calif.

RESEARCH IN HIGH TEMPERATURE BEARING LUBRICATION IN THE ABSENCE OF LIQUID LUBRICANTS. Progress Report No. 8 for May 1957 through July 1957. R. A. Coit and S. S. Sorem. 15p. Contract AF-33(616)-2999. (S-13730).

From the studies conducted during this period the following tentative conclusions may be drawn. With n-heptane as the "protective atmosphere", air-fuel ratio in the absence of additives only slightly affects bearing conditions between air-fuel ratio limits of 6.0 and 13.8. Under cyclic bearing temperature "protective atmosphere" operation, inclusion of light mineral oils in the atmosphere leads to bearing failures caused by deposits. For wide temperature range (150 to 800°F) bearing operation a "protective atmosphere" containing sulfur appears to be the best over-all compromise. Bearing deficiencies become a limiting factor for operations with M2 and M10 tool steel bearings above about 800°F. (For preceding period see NP-6332.) (auth)

12669 NP-6429

Mine Safety Appliances Co., Callery, Penna.

CLEANING ALKALI METAL SYSTEMS WITH LIQUID AMMONIA. Memo 59. W. Milich and E. C. King. June 9, 1954. Decl. Aug. 2, 1955. 8p. Contract NObs-65426.

Results of two cleaning operations indicate that liquid NH_3 and NH_3–NH_4Cl washes are an effective method of removing Na and Na sludges from a liquid metal system. (W.L.H.)

12670 PRL-5.20

Pennsylvania State Univ., University Park. Petroleum Refining Lab.

FLUIDS, LUBRICANTS, FUELS AND RELATED MATERIALS. Quarterly Report for January, February, and March 1957. Mar. 30, 1957. 99p. Contract AF33(616)-2851.

Results are given of the development of a high-temperature hydraulic fluid for use in closed systems at temperatures up to 700°F, and a high temperature jet engine lubricant for use at 500 to 600°F bulk oil temperature and 750°F hot spot temperatures. (For preceding period see PRL-5.19.) (W.L.H.)

12671 AERE-Lib/Trans-726

THEORY OF CONCENTRATION POLARIZATION. V. G. Levich. Translated by P. Collins from Zhur. Fiz. Khim. 18, 335-55(1944). 29p.

12672 AERE-Lib/Trans-760

REACTION OF THORIUM OXIDE WITH ITS CHLORIDE IN MOLTEN SALT SOLUTIONS. M. V. Smirnov and L. E. Ivanovskii (Ivanowskii). Translated by S. Botcharsky from Zhur. Neorg. Khim. 1, 1843-9(1956). 12p.

The reaction between ThO_2 and its chloride was studied at 840°C temperature. The formation of $ThOCl_2$ was investigated by heating the oxide in a molten eutectic mixture of Li and K chlorides with varying content of ThCl. It has been found that $ThOCl_2$ is practically insoluble in molten chloride or fluoro-chloride solutions and that in molten chloride solutions in contact with $ThOCl_2$ the thoryl ions (ThO^{2+}) are not present. (R.V.J.)

ANALYTICAL PROCEDURES

12673 DP-218

Du Pont de Nemours (E. I.) & Co. Savannah River Lab., Augusta, Ga.

ANALYSIS OF USED ION EXCHANGE RESINS. Elizabeth W. Baumann. June 1957. 24p. Contract AT(07-2)-1. $0.25(OTS).

A scheme for analyzing used, mixed ion exchange resins is described. The methods are suitable for slightly radioactive resins. (auth)

12674 OSR-TN-57-159

Chicago Development Corp., Riverdale, Md.

ELECTRODE POTENTIAL MEASUREMENTS OF INTERSTITIAL OXYGEN SOLUTIONS IN TITANIUM AT LOW OXYGEN CONCENTRATIONS. APPLICATION TO QUALITY CONTROL IN HIGH PURITY TITANIUM. Report No. 1. R. S. Dean and I. Hornstein. Apr. 1957. 23p. Project No. 19751. Contract AF18(600)-1458.

A quick and accurate method for measuring O_2 in the quality control of high-purity Ti is reported. Studies are extended to electrode potentials of the O_2–Ti system at O_2 contents below 0.06%. (auth)

12675 WAL-401/271

Watertown Arsenal Lab., Mass.

A BROMINATION METHOD FOR THE SEPARATION AND DETERMINATION OF CERIUM IN TITANIUM. M. P.

Brash and A. B. Goulston. Aug. 1957. 16p. DA Project 5B93-08-021.

A bromination procedure was developed which separates most of the Ti and the alloying elements from Ce. A series of chemical separations then removes the remaining interfering elements. Cerium may be finally determined by gravimetric, volumetric, or colorimetric procedures. The precision is represented by a coefficient of variation of 0.4%. The bromination procedure requires 90 min for two samples, and two hours is required for subsequent procedures. (auth)

12676 WAPD-CTA(GLA)-170(Rev. 1)
Westinghouse Electric Corp. Bettis Plant, Pittsburgh.
DETERMINATION OF NITROGEN IN ZIRCONIUM AND ZIRCONIUM BASE ALLOYS. G. J. Harter, A. W. Perrine, and J. F. Rodgers. Apr. 18, 1957. 6p. $1.80(ph OTS); $1.80(mf OTS).

The sample is dissolved in HCl and HF. The resulting solution is made basic with strong NaOH solution, and N is separated as ammonia by steam distillation. Ammonia is determined spectrophotometrically in the distillate with Nessler reagent. The method covers the determination of N in Zr and Zircaloy-2 and -3 in the range of 5 to 120 ppm of N on a one gram sample basis. Range and sensitivity of the method can be varied by varying sample size and wavelength and depth of solution used for photometric measurement. (auth)

12677 WAPD-CTA(GLA)-371
Westinghouse Electric Corp. Bettis Plant, Pittsburgh.
THE DETERMINATION OF TIN IN ZIRCONIUM BASE ALLOYS. T. C. Bryson, G. W. Goward, W. A. Perrine, and J. F. Rodgers. Apr. 18, 1957. 4p. $1.80(ph OTS); $1.80(mf OTS).

A method is reported for the determination of Sn in Zircaloy-2 and Zircaloy-3 by the reduction of Sn to the stannous state with Pb in HCl–HF medium and titrating the stannous Sn with a standard iodate–iodide solution. (J.E.D.)

12678 AEC-tr-3040
POLYGRAPHIC INVESTIGATION OF SULFURIC ACID SOLUTION OF TITANIUM AND NIOBIUM. E. I. Krylov, D. S. Kolevatov, and V. A. Samarina. Translated from Doklady Akad. Nauk S.S.S.R. 98, 593-5(1954). 7p.

An abstract of this paper appears in Nuclear Science Abstracts as NSA 9-538.

12679
SOLVENT EXTRACTION IN ANALYTICAL CHEMISTRY. George H. Morrison and Henry Freiser. New York, John Wiley & Sons, Inc., 1957. 277p.

DEUTERIUM AND DEUTERIUM COMPOUNDS

12680
ADIABATIC PIEZO-OPTIC COEFFICIENT OF HEAVY WATER. C. K. Narayanaswamy, P. S. Narayanan, and R. S. Krishnan (Indian Inst. of Science, Bangalore). Nature 180, 497-8(1957) Sept. 7.

FLUORINE AND FLUORINE COMPOUNDS

12681
THE HYDROGEN FLUORIDE SOLVENT SYSTEM. II. SALTS OF THE FLUORO ACIDS. SOLVOLYSIS. A. F. Clifford and A. G. Morris (Univ. of Deleware, Newark). J. Inorg. and Nuclear Chem. 5, 71-5(1957).

The stoichiometries of a number of solid salts of fluoro acids have been determined by evaporation of anhydrous HF solutions of the salts containing excess of the volatile acidic constituent. Salts of fluoro acids of P, As, Ge, Se, Te, and I have been examined. Many of these are highly solvolyzed. The new bifluoride $BaHF_3$ is reported. (auth)

12682
THE HYDROGEN FLUORIDE SOLVENT SYSTEM. I. A. QUALITATIVE SURVEY OF ACIDS. A. F. Clifford, H. C. Beachell, and W. M. Jack (Univ. of Delaware, Newark). J. Inorg. and Nuclear Chem. 5, 57-70(1957).

In accord with the idea that, as in water and ammonia, acid-base reactions should be possible in hydrogen fluoride and since only substances basic with respect to this solvent were known, a search was undertaken for acids belonging to the hydrogen fluoride system. It was found, as expected, that due to the extremely acid nature of the solvent, the substances capable of acting as acids in it were indeed limited in number. Of all the acids investigated (covering a large portion of the possibilities) the hydrogen fluoride solutions of only four—SbF_5, AsF_5, BF_3, and SnF_4—were found to be capable of dissolving electropositive metals. Many evidences, such as salt formation, were found for the existence of weaker acids. Thus argentous salts were prepared from solutions in HF of BF_3, SiF_4, GeF_4, SnF_4, TiF_4, SeF_4, PF_5, AsF_5, SbF_5, IF_5, VF_5, NbF_5, TaF_5, TeF_6, MoF_6, WF_6, and probably ReF_6. A typical example is the salt $AgAsF_6$. Many of these salts were insoluble in hydrogen fluoride. The phenomenon of amphoterism was demonstrated for salts of trivalent chromium, trivalent antimony, aluminum, and beryllium. Zinc, tripositive iron, and tripositive cobalt were found to be nonamphoteric. The restrictive effect of co-ordination number was found to be a much severer limitation on the acidity of the fluoroacids than in the case of oxyacids, due to the larger number of fluorine atoms required to form the negative ions. This can easily be seen by comparing PO_4^{-3} and PF_6^-. (auth)

12683
THE HYDROGEN FLUORIDE SOLVENT SYSTEM. III. THE PREPARATION OF ANHYDROUS SILVER FLUOROBORATE. A. F. Clifford and S. Kongpricha (Purdue Univ., West Lafayette, Ind.). J. Inorg. and Nuclear Chem. 5, 76-8 (1957).

Pure $AgBF_4$ has been prepared by precipitation from anhydrous HF solutions of $AgNO_3$ with BF_3. (auth)

12684
MICRODETERMINATION OF ELEMENTARY FLUORINE. E. A. Peregud and B. S. Bolkina (State Research Inst. of Occupational Hygiene and Diseases). Zhur. Analyt. Khim. 12, 513-15(1957) July. (In Russian)

Quantitative methods for the determination of traces of elementary fluorine in air have been developed on the basis of the reaction with fluorescein and methyl red. (tr-auth)

GRAPHITE

12685 HW-49626(Rev.)
General Electric Co. Hanford Atomic Products Operation, Richland, Wash.
DISTRIBUTION OF RADIATION DAMAGE IN GRAPHITE. R. E. Nightingale and W. A. Snyder. June 18, 1957. 12p. Contract W-31-109-Eng-52. $0.20(OTS).

Experiments were made to determine the annealing characteristics over a wide range of activation energies. A series of graphite samples with reactor irradiation exposure from 400 to 5700 Mwd/t was thermally annealed, and the changes in length of graphite samples were studied in relation to changes in C_o the distance between alternate layer planes, and L_c, the crystallite size. Annealing was

performed with temperature increases in 50 to 150°C intervals; the activation energy was calculated for each time-temperature annealing schedule. Changes in properties were compared through the exposure range. (R.V.J.)

12686 NP-6418

Illinois Inst. of Tech., Chicago. Armour Research Foundation.

GRAPHITE TECHNOLOGY. Progress Report No. 2 for the Period June 1, 1957 to August 1, 1957. S. W. Bradstreet. Aut. 1, 1957. 23p. Project G-033. Contract AF33(616)-5185.

Experimental work has started on the study of selected binder materials, on methods of fabrication for laboratory specimens, and on techniques of carbonization. The reasons for conducting these experiments are discussed both on an empirical and a structural basis. Of the selected binder materials, the "standard" coal tar pitch has been confirmed to exhibit the highest coke residue value, and polyacrylonitride, a butyl-phenyl phenolic, gilsonite, a polymerized trimethyl dihydroxyquinoline, and a cellulose acetate were regarded as representative of systems worthy of added study. Molding of specimens at 125°C produced "standard" specimens with a green density of about 1.70 g/cc; the dry resins produced green densities between 1.4 and 1.55 gm/cc. In studying the techniques of cold molding, a system of filling the mold evenly while vibrating it was found to reduce air entrapment significantly. (For preceding period see NP-6378.) (auth)

MOLECULAR STRUCTURE

12687 WADC-TR-56-540

California. Univ., Los Angeles.

SPIRANES AND OTHER RIGID MOLECULES. D. J. Cram. Oct. 1956. 91p. Project No. 3044. Contract AF33(616)-146. (AD-130872).

The chemistry of spiro [4.4] nonane has been investigated. The preparation and determination of the stereochemical structures of 1,6-dihydroxy [4.4] nonane and of 1-keto-6-hydroxyspiro [4.4] nonane have been made. The synthesis of 1-spiro [4.4] nonene, 1,3-spiro [4.4] nonadiene, and 1,6-spiro [4.4] nonadiene are described, as well as the behavior of the conjugated diene as a reactant in the Diels-Alder Reaction. The substitution and reduction reactions of [2.2] paracyclophane have been investigated. The rigidity of this molecule, the strain associated with the bent benzene rings and the internal compression of the reduction products of the substance provided abnormal courses for some of these reactions. The synthesis of a second semirigid system, 1,7-cyclododecadiyne, has been accomplished. Attempts to make the more strained lower homologues of this system failed. The information obtained from these research results will serve as a guide to future Air Force research activity in the field of "rigid molecules" as potential thermally stable and/or nuclear radiation-stable materials. Thus, [2.2] paracyclophane has been reported to be stable at temperatures over 700°C. After a careful screening, it is anticipated that a contract will be negotiated to synthesize the most promising compounds in one-pound lots so that their physical and chemical properties may be extensively tested. (auth)

RADIATION CHEMISTRY

12688

RADIATION-INDUCED EXCHANGE OF CHLORINE WITH CARBON TETRACHLORIDE. John W. Schulte (Los Alamos Scientific Lab., N. Mex.). J. Am. Chem. Soc. 79, 4643-8 (1957) Sept. 5.

The chemical and virtual changes in CCl_4 containing Cl_2 under the influence of Co^{60} γ rays have been investigated. Two reactions are observed: the exchange of Cl_2 with CCl_4, and the decomposition of CCl_4 to form C_2Cl_6 and Cl_2. The rates of both reactions are independent of the chlorine concentration and directly proportional to the dose rate. The former reaction is interpreted as a measure of the "radical yield" in the system, and it is observed to occur with an efficiency corresponding to 3.5 ± 0.35 molecules of chlorine being brought into exchange with CCl_4 for every 100 e.v. absorbed. The latter reaction is interpreted as a measure of molecular yield and takes place with an efficiency of 0.80 ± 0.06 molecule of C_2Cl_6 and Cl_2 being formed for every 100 e.v. absorbed. Spontaneous exchange and exchange under the influence of sunlight and ultraviolet light also were noted. (auth)

12689

CYCLIZATION IN GAMMA RAY IRRADIATED HIGH DENSITY POLYETHYLENE. Malcolm Dole, D. C. Milner, and T. F. Williams (Northwestern Univ., Evanston, Ill.). J. Am. Chem. Soc. 79, 4809(1957) Sept. 5.

12690

NEUTRON IRRADIATION OF SOME CRYSTALLINE SALTS OF PHOSPHORIC, PHOSPHOROUS, AND HYPOPHOSPHOROUS ACIDS IN VACUUM. Philip A. Sellers, Takuya R. Sato, and Harold H. Strain (Argonne National Lab., Lemont, Ill.). J. Inorg. and Nuclear Chem. 5, 31-47(1957).

The radioactive products obtained by the neutron plus gamma irradiation of phosphorus compounds depend upon the conditions of the irradiation and upon the nature of the compounds irradiated. In vacuum, where easily oxidized, neutron activation products such as elemental phosphorus or phosphine should be recoverable. The principal radioactive irradiation product of anhydrous Na_2HPO_4 was phosphate, which was accompanied by traces of phosphorus and several unidentified products. The principal radioactive irradiation products of anhydrous Na_2HPO_3 and NaH_2PO_2 were phosphite and hypophosphite accompanied by a little phosphate and phosphorus. Neither phosphine nor diphosphine was detected as an irradiation product of these salts. The principal neutron irradiation products of PH_3 were H_2 and radioactive PH_3 and P. As shown by analysis, most of the radioactive products were formed in chemically detectable quantities, but the specific activity of these products was greater than that of the irradiated substances themselves. In vacuum, gamma rays alone scarcely altered Na_2HPO_4, but they converted Na_2HPO_3, NaH_2PO_2, and PH_3 into the same products formed by neutrons plus gamma rays. In the reactor where the gamma rays accompanying the neutrons are very intense, the final neutron irradiation products of Na_2HPO_4, Na_2HPO_3, and NaH_2PO_2 in vacuum were the primary neutron activation products, the gamma-ray alteration products of these primary activation products, and the neutron activation products of the gamma-ray modifications of the original salts. Slight alteration of the phosphate by neutrons plus gamma rays indicates that the dissipation of the nuclear energy after the absorption of a neutron does not disrupt the chemical bonds of the recoiling atoms in nearly all instances. The formation of similar products by gamma irradiation and by neutron plus gamma irradiation of phosphite and hypophosphite indicates that the gamma-induced reactions and the neutron-induced reactions have similar but not necessarily identical mechanisms. (auth)

RADIATION EFFECTS

12691 D2-1819
Boeing Airplane Co., Seattle.
EFFECTS OF NUCLEAR RADIATION ON CORK, LEATHER, AND ELASTOMERS. C. J. DeZeih. June 25, 1957. 24p.

Samples of cork, leather, and various elastomers were irradiated in the Co^{60} gamma source at dosages of ~ 10^7 to 10^{10} ergs/gram. No significant changes were observed for cork. Tensile strength of leather was affected; no hardening was noticed. These materials can be used in certain systems in nuclear environments. Elastomers SE-551 and SE-371 are affected by nuclear radiation. At ~ 10^{10} ergs tensile strength and elongation properties decrease considerably, while hardness increases to the point of crumbling. High-temperature Thiokol exhibits good properties after irradiation. Viton A retains usable tensile strength up to ~ 10^{10} ergs, with some increase in hardness. At ~ 10^{10} ergs the percent of elongation of Viton A drops considerably. Viton A and high-temperature Thiokol appear to be promising materials for use in nuclear environments. (auth)

12692 NP-6430
Stanford Research Inst., Menlo Park, Calif.
THE EFFECT OF NUCLEAR RADIATION ON STRUCTURAL ADHESIVES AND PLASTICS. Bimonthly Report No. 1 [for] June 7, 1957 to August 15, 1957. R. Y. Mixer. Aug. 15, 1957. 7p. SRI Project SU-2228. Contract AF-33(616)-5369.

Some experiments to determine the effects of radiation on structural adhesives and laminating resins are described. The effects of p-quaterphenyl and triphenyl phosphate in protection of Epon VIII resin from radiation was studied. (See also NP-6244.) (T.R.H.)

12693 NP-6431
California Research Corp., Richmond, Calif.
EFFECTS OF RADIATION ON AIRCRAFT LUBRICANTS AND FUELS. Quarterly Report No. 6 [for] Period February 28 to May 31, 1957. May 31, 1957. 100p. Project title: ANPP SUPPORT. Task title: RADIATION EFFECTS. Contract AF-33(616)-3184.

All data are tabulated for the current best products developed in research on greases, hydraulic fluids, gas turbine oils, and gear lubricants. (For preceding period see NP-6329.) (W.L.H.)

12694 RIA-55-3641
Rock Island Arsenal Lab., Ill.
PHYSICAL PROPERTIES OF GAMMA RADIATION CURED ELASTOMERS. Z. T. Ossefort. [Oct. 1955]. 27p. (AD-121406).

The results obtained indicate that the treatment of vulcanized elastomers with high-energy irradiation results in degradative reactions, the severity of which depend upon the radiation dosage. Treatment of unvulcanized rubbers, on the other hand, by similar radiation produces a high state of cure in many of these rubbers. The state of cure is dependent upon the radiation exposure, and optimum cure differs for each elastomer. The vulcanizates thus obtained have excellent age resistance and appear to have a better balance between low temperature flexibility and oil resistance than similar vulcanizates obtained by conventional means. (auth)

12695
RATE OF PROPAGATION OF PROPANE-AIR FLAMES IRRADIATED WITH A 10,000-CURIE GOLD SOURCE. S. W. Churchill, Alexander Weir, Jr., R. L. Gealer, and R. J. Kelley (Univ. of Michigan, Ann Arbor). Ind. Eng. Chem. 49, 1419-22(1957) Sept.

Beta radiation from a 10,000-curie gold source can increase the flame speed of low-pressure propane–air Bunsen flames up to 50%. (auth)

12696
EMISSION SPECTRA OF PROPANE–AIR FLAMES IRRADIATED WITH A 1000-CURIE GOLD SOURCE. Alexander Weir, Jr., S. W. Churchill, L. F. Ornella, and M. E. Glucksteln (Univ. of Michigan, Ann Arbor). Ind. Eng. Chem. 49, 1423-8(1957) Sept.

Intense β irradiation of propane–air mixtures and flames increases the emission due to CH and C_2 but hardly effects the emission due to OH. (auth)

12697
RADIATION STABILITY OF COPPER PHTHALOCYANINE. Mark T. Robinson and Gilbert E. Klein (Oak Ridge National Lab., Tenn.). J. Phys. Chem. 61, 1004(1957).

SEPARATION PROCEDURES

12698 AECU-3540
Massachusetts Inst. of Tech., Oak Ridge, Tenn. Engineering Practice School.
HYDRAULIC TEST OF 36 INCH DIAMETER HIGGINS COLUMN. J. O. Cowles, R. W. Wolff, and D. A. Cameron. Dec. 20, 1956. 24p. For Oak Ridge Gaseous Diffusion Plant. Contract [W-7405-Eng-26]. $4.80(ph OTS); $2.70 (mf OTS).

A 36-in. Higgins ion exchange column was constructed in order that hydraulic tests of a commercial size column could be made. Information obtained in a test of the effect of head pressure and pulse time on the pulsing of this 36-in. column is given. A design is presented for a meter to measure the cumulative flow of resin over a period of operation. (W.L.H.)

12699 CF-57-9-50
Oak Ridge National Lab., Tenn.
HRT IODINE REMOVAL BED. E. H. Gift. Sept. 10, 1957. 39p. Contract W-7405-eng-26. $6.30(ph OTS); $3.00 (mf OTS).

An iodine removal bed primarily for the purpose of preventing poisoning of the recombiner catalyst was designed for operation in the HRT. The bed consists of a 12-in.-ID, 36-in.-long cylinder filled with ½ in. silvered alundum Raschig rings. During operation, the steam gas mixture entering the bed is dried by a steam coil preceding the bed. During shutdown decay heat must be removed for the first 10 hr by a combination of steam flow from the dump tanks and internal cooling of the bed by water jacketed annuli. After about 10 hr the cooling capacity of the water jacketed annuli will be sufficient to remove the heat. A sketch of the bed is shown, and reference drawings are given. (auth)

12700 HW-46065
General Electric Co. Hanford Atomic Products Operation, Richland, Wash.
TECHNICAL INFORMATION FOR APPLICATION OF DIFFERENTIAL PRESSURE TRANSMITTERS IN PULSE COLUMN BOTTOM INTERFACE CONTROL SYSTEMS. A. E. Smith. Oct. 8, 1956. 7p. Contract [W-31-109-Eng-52]. $1.80(ph OTS); $1.80(mf OTS).

The information in this report is based on experience with a similar unit installed on experimental pulse columns in the 321 Building. These installations were made to demonstrate the feasibility of the system. In one case, the installation on the 2A Prototype Column, the differential

pressure cell (D/P cell) bottom interface control system was monitored by a capacitance-type instrument. The other installations were made on glass columns and were monitored visually. (auth)

12701 KAPL-1808

Knolls Atomic Power Lab., Schenectady, N. Y.

BELGIAN SYMPOSIUM ON CHEMICAL PROCESSING, I SESSION: ENGINEERING OF RADIOCHEMICAL PLANTS CONTACTORS AND AUXILIARIES. J. K. Davidson. June 27, 1957. 49p. Contract W-31-109-Eng-52. $0.35(OTS).

Several variations of the pulse column and mixer-settler contactors for liquid-liquid extraction in radiochemical facilities and pilot plants are described. Included are a $^{3}/_{4}$-in. pulse column, a 1-in. vertical pulse column, the profile pulse column, and the concatenated pulse column. The mixer-settler systems include the pilot plant "Midi" mixer-settler, the laboratory "Mini" mixer-settler, a critically safe mixer-settler, and a continuous solvent wash unit. Details of necessary auxiliaries are discussed, and reference is made to designs and construction. (auth)

12702 NAA-SR-1922

Atomics International Div., North American Aviation, Inc., Canoga Park, Calif.

PRE QUARTERLY PROGRESS REPORT [FOR] JANUARY–MARCH 1957. D. I. Sinizer, J. R. Foltz, K. L. Mattern, and E. E. Motta. June 30, 1957. 44p. Contract AT(11-1)-GEN-8. $0.30(OTS).

A site has been selected for the PRE, and installation and testing of equipment are reported. (For preceding period see NAA-SR-1855.) (T.R.H.)

12703 ORNL-2332

Oak Ridge National Lab., Tenn.

A CRITICALITY STUDY OF THE THOREX PILOT PLANT. O. O. Yarbro. Sept. 17, 1957. 29p. Contract W-7405-eng-26. $0.25(OTS).

A recent criticality study has indicated that the Thorex Pilot Plant is critically safe for the processing of thorium irradiated to less than 10,000 grams of U^{233} per ton. As the size of equipment exceeds the geometrically safe size and the total uranium inventory exceeds the minimum critical mass, minor equipment modifications and changes in operational procedures were necessary to provide safety under adverse operating conditions. (auth)

12704 RME-3149

Colorado School of Mines Research Foundation, Inc., Golden.

PHASE TWO-STUDY OF THE EFFECTS OF CRUDE OIL CONSTITUENTS ON THE REDUCTION AND PRECIPITATION OF URANIUM. May 9, 1957. 23p. Project No. 550837. Contract AT(05-1)-462.

The chemical feasibility of liquid hydrocarbons reducing or dissolving U salts is reported. The first phase of this program concerned the chemical ability of natural gas, and its associated H_2S content, to precipitate primary U from pregnant solutions. The results showed that primary U minerals can be precipitated from pregnant solutions by natural gas and this precipitation is achieved by reduction of soluble hexavalent U salts to insoluble tetravalent compounds. The reducing agent is primarily the H_2S present in the natural gas, but H_2, and perhaps methane, in the gas and ferrous ions in the pregnant solution contribute to the reaction. A preliminary investigation of the effects of the associated crude oils and liquid hydrocarbons present in the system was made. (auth)

12705 WIN-39

National Lead Co., Inc. Raw Materials Development Lab., Winchester, Mass.

ALKALINE RESIN-IN-PULP PROCESS FOR THE RECOVERY OF URANIUM FROM ITS ORES. J. Q. Jones, J. G. Roeschlaub, R. L. Shimmin, H. F. Wilson, and H. D. Moulton, Jr. Jan. 19, 1956. Changed from OFFICIAL USE ONLY Sept. 5, 1957. 71p. Contract AT(49-6)-924. $6.30(ph OTS); $3.00(mf OTS).

Test results from the La Sal run proved the practicability and reliability of resin-in-pulp ion-exchange methods for the recovery of U from carbonate leach pulps. Results from Utex testing demonstrated that V bearing ores are amenable to the Resin-in-Pulp Process. (auth)

12706 WIN-61

National Lead Co., Inc. Raw Materials Development Lab., Winchester, Mass.

TECHNIQUES FOR THE EVALUATION OF AMINES AS URANIUM EXTRACTANTS AND PROPERTIES OF SOME SATISFACTORY AMINES. Henry G. Petrow, Oscar A. Nietzel, John C. Apidianakis, Robert W. Lindstrom, and Charles F. Lubinger. Aug. 26, 1957. 48p. Contract AT(49-6)-924. $7.80(ph OTS); $3.30(mf OTS).

The techniques used at the Winchester Laboratory to evaluate commercially available amines for use as U extractants from sulfate leach liquors are presented. The techniques include initial loss and steady state solubility loss to 0.5M H_2SO_4, U extraction and stripping properties, U capacity, solvent entrainment loss, and amine solubility loss to a leach liquor. The techniques are designed to yield maximum information with a minimum of analytical services. Data are presented for those amines which are considered as satisfactory for use as U extractants. The amines include Amine 9D-178, Amine S-24, triisooctylamine, trilaurylamine, Amine RC-3749, Amine D-205, Amine 7F-802, and N-benzylheptadecylamine. Data are also presented demonstrating that by the judicious choice of amine extractant, leach liquor potential, stripping reagent, and precipitation technique, a U concentrate can be produced from a variety of leach liquors which will meet concentrate specifications. (auth)

12707 WIN-73

National Lead Co., Inc. Raw Materials Development Lab., Winchester, Mass.

PILOT PLANT STUDIES OF ATMOSPHERIC AND PRESSURE LEACHING OF URANIUM ORES IN ALKALINE SOLUTIONS. R. G. Beverly, W. A. Millsap, and G. Winslow. June 11, 1957. 39p. Contract AT(49-6)-924. $6.30(ph OTS); $3.00(mf OTS).

Studies were made comparing leach results in an autoclave and Pachuca tanks. The report presents the results of these studies and the effect of several variables such as contact time, temperature, and partial pressure of O_2, a variable which is determined not only by the total pressure of the system and the vapor pressure of water but also by the rate at which consumed O_2 is replaced. Estimated utility costs for operation of different leaching equipment used are also presented. The report concludes that increasing temperature reduces contact time appreciably, and total air addition can be reduced by use of higher pressures. Leaching under pressure requires less steam and power than at atmospheric pressure. (auth)

12708 WIN-74

National Lead Co., Inc. Raw Materials Development Lab., Winchester, Mass.

AMENABILITY TESTING OF LAKEVIEW ORES. D. R. George and R. U. Johnson. Aug. 15, 1957. 38p. Contract AT(49-6)-924. $6.30(ph OTS); $3.00(mf OTS).

The results of laboratory amenability testing of five samples of ore from the Lucky Lass and White King Claims of the Lakeview Mining Company in Lake County, Oregon, are presented. The test work includes acid and carbonate leaching, settling and filtration testing, and ion exchange of

acid leach liquors. Rather extensive investigations of the use of solvents to extract the uranium have been made, and the results are being presented in a separate report. (auth)

12709

CONTINUOUS COLD TRAP FOR FLUORIDE VOLATILITY PROCESSING OF URANIUM. J. C. Bresee and P. R. Larson (Engineering Practice School, Massachusetts Inst. of Tech., Oak Ridge, Tenn.). Ind. Eng. Chem. 49, 1349-54 (1957) Sept.

A continuous condenser for recovery of UF_6 from inert diluent gases in a fluoride volatility process is described. (auth)

12710

ADSORPTION AND SOLVENT EXTRACTION PROCEDURES FOR THE SEPARATION OF CARRIER-FREE INDIUM FROM CADMIUM. Katheryn L. Lawson and Milton Kahn (Univ. of New Mexico, Albuquerque). J. Inorg. and Nuclear Chem. 5, 87-92(1957).

Procedures are given for the rapid separation of tracer quantities of indium from macro amounts of cadmium by adsorption and extraction techniques. The indium is adsorbed on to glass, paper, or cellulose ester fibers from ammoniacal solution and is extracted from buffered acetate solutions by 8-hydroxyquinoline in chloroform. (auth)

SPECTROSCOPY

12711

INFRA-RED SPECTRA OF INORGANIC SOLIDS. II. OXIDES, NITRIDES, CARBIDES, AND BORIDES. Edward G. Brame, Jr., John L. Margrave, and Villiers W. Meloche (Univ. of Wisconsin, Madison). J. Inorg. and Nuclear Chem. 5, 48-52(1957).

A series of oxide, nitride, carbide, and boride samples were scanned in the rock-salt region of the infra-red. The KBr disk technique was employed for the examination. The spectra show certain characteristic bands for each of the sets of compounds studied. Changes in band position for the major bands were noted with changes in mass for a number of the samples. (auth)

SYNTHESES

12712 RMI-073-Q3

Reaction Motors, Inc., Denville, N. J.

HIGH TEMPERATURE STABLE SEMIORGANIC FLUIDS. Quarterly Progress Report No. 3 [covering period] September 1 to November 30, 1956. Daniel Grafstein. Jan. 15, 1957. 21p. Project 073. Contract AF33(616)-3417.

Two new chain terminating agents, phenylmethylchlorofluorosilane and phenylmethylfluoroethoxysilane, have been prepared for the first time. A series of new fluids have been prepared utilizing one of these new agents, phenylmethylchlorofluorosilane. These fluids displayed improved thermal stability properties and attractive viscosity-temperature relationships. A new type of reaction was observed between a propoxychlorosilane and boron trifluoride. Instead of the anticipated simple fluorination reaction, an alkyl chloride elimination was noted. The acid stability of the polyfluorosiloxane system was demonstrated. An attempted anhydrous condensation of chlorofluorosilane was unsuccessful. (auth)

TRANSURANIC ELEMENTS AND COMPOUNDS

12713 AEC-tr-3048

ANALYTICAL CHEMISTRY OF NEPTUNIUM. I. P. Alimarin and Yu. A. Zoltov. Translated from Uspekhi Khim. 26, 625-39(1957). 32p.

An abstract of this paper appears in Nuclear Science Abstracts as NSA 11-10494.

12714

HALF-LIFE OF ^{238}Pu. Darleane C. Hoffman, George P Ford, and Francine O. Lawrence (Los Alamos Scientific Lab., N. Mex.). J. Inorg. and Nuclear Chem. 5, 6-11(1957)

The half life of Pu^{238} has been measured by determining its rate of growth from Cm^{242}. The weighted average of two determinations is 86.41 years, with an estimated error of 0.3 year. (auth)

URANIUM AND URANIUM COMPOUNDS

12715 AERE-C/R-1652

Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.

THE REDUCTION OF URANIUM HEXAFLUORIDE TO URANIUM TETRAFLUORIDE BY TRICHLOROETHYLENE. N. J. Keen and D. Rees. Apr. 1955. Decl. July 16, 1957. 17p.

Uranium hexafluoride is only partially reduced by liquid trichloroethylene at room temperature to give intermediate fluorides. The product is finely divided and hydrolyzes in moist air. Reduction to the tetrafluoride is completed on boiling with trichloroethylene. A considerable quantity of fluorinated trichloroethylene is adsorbed on the product but can be removed by heating to 500°C in N. The solubility of UF_6 in several inert solvents was determined. (auth)

12716 ANL-5765

Argonne National Lab., Lemont, Ill.

INTERACTION OF URANIUM AND ITS ALLOYS WITH CERAMIC OXIDES. H. M. Feder, N. R. Chellew, and C. L. Rosen. July 1957. 21p. Contract W-31-109-eng-38. $0.75(OTS).

The corrosion of ceramic oxides by molten U and its alloys was examined. Dense, high-purity alumina, magnesia, zirconia, beryllia, and thoria were studied. The studies included: (a) wettability of ceramics; (b) products of reaction; (c) mechanism of reaction; (d) contamination of molten U by crucible material; and (2) the effect of alloying additions on these. (auth)

WASTE DISPOSAL

12717 BNL-446

Brookhaven National Lab., Upton, N. Y.

STUDIES ON CHARACTERISTICS OF SAVANNAH RIVER WASTES. Final Report. B. Manowitz, C. W. Pierce, and S. Zwickler. Apr. 1957. 31p. $0.25(OTS).

Pilot plant and laboratory studies were made in support of the Savannah River program of storage and concentration of wastes. A pilot plant test tower was constructed as a representative section of a Savannah River waste tank. Purex-type wastes with varying settling characteristics were cooled, concentrated, and stored under conditions simulating proposed operation of the regular tank farm. Vertical temperature distribution, decontamination factors, over-all heat transfer coefficients, and foaming characteristics were observed. Operating procedures were studied to determine means for slurrying and transferring settled wastes. A procedure was also developed for measuring sludge height in tanks. Observations were made in the laboratory of the settling characteristics of waste stream sludges. Corrosion of 1020 mild steel by the various waste streams was investigated. Attempts were also made to create steam surges in typical Savannah River and Hanford wastes due to fission product heat generation.

The foaming and scaling characteristics of low level wastes were followed for evaluation of waste concentration criteria. The radiation stability of the gluconic acid complexed scavenger cake was examined. Finally, the use of the LAW stream in the dissolver solution was investigated. (auth)

12718 BNL-453
Brookhaven National Lab., Upton, N. Y.
SEPARATION OF CESIUM AND STRONTIUM FROM CALCINED METAL OXIDES AS A PROCESS IN DISPOSAL OF HIGH LEVEL WASTES. A. Abriss, J. J. Reilly, and E. J. Tuhill. Apr. 1957. 12p. $0.50(OTS).

Results are reported from exploratory studies to determine design parameters for a plant for processing Redox Al-type and STR Zr-type wastes for the recovery of Sr^{90} and Cs^{137} The three types of leaching procedures investigated included a non-continuous agitated system, a continuous non-agitated system, and a continuous system with mixing. Data are presented graphically. (C.H.)

12719 IDO-14416
Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.
CALCINATION OF ALUMINUM-TYPE REACTOR FUEL WASTES IN A FLUIDIZED BED. E. S. Grimmett. Aug. 1, 1957. 18p. Contract AT(10-1)-205. $0.75(OTS).

The conversion of aqueous aluminum-type reactor fuel wastes into a free-flowing granular aluminum oxide solid by means of a fluidized bed calciner was investigated. A 6-inch diameter calciner at ICPP was successfully operated on simulated aluminum type waste over feed rates varying from 20 to 110 ml/min, over temperatures ranging from 180 to 500°C, and for periods of operation between startup and shutdown of from eight hours to 336 hours. The effect of operating variables on the operation of the calciner is discussed. (auth)

ENGINEERING

12720 KAPL-M-WFC-1
Knolls Atomic Power Lab., Schenectady, N. Y.
STRESSES IN SEAL WELDS. W. F. Cook. July 20, 1957. 33p. Contract W-31-109-Eng-52. $4.80(ph OTS); $2.70 (mf OTS).

The solution for stresses induced in seal welds by displacements and pressure forces is shown. The results are in the form of curves from which stresses may be easily calculated. (auth)

HEAT TRANSFER AND FLUID FLOW

12721 K-1302(Pt. VI)
Oak Ridge Gaseous Diffusion Plant, Tenn.
THE PROBLEM OF KNUDSEN FLOW. PART VI. TORTUOSITY. W. C. DeMarcus and H. B. Jenkins, Jr. Sept. 30, 1957. 14p. Contract W-7405-eng-26. $3.30 (ph OTS); $2.40(mf OTS).

Since the preceding portions of this report were mainly concerned with systems exhibiting very simple geometries, it has seemed worthwhile to investigate an example of a tortuous system. A simple system with periodic turns has consequently been investigated, and numerical results for the transmission probabilities have been obtained for the two cases of diffuse reflection and a small percentage of specular reflection. The results are presented in the form of numerical values for the tortuosity shape factor. (auth)

12722 NACA-TN-3934
Lewis Flight Propulsion Lab., Cleveland.
EXPERIMENTAL STUDY OF HEAT TRANSFER TO SMALL CYLINDERS IN A SUBSONIC, HIGH-TEMPERATURE GAS STREAM. George E. Glawe and Robert C. Johnson. Mar. 1, 1957. Includes Appendix C. Richard S. Brokaw and Robert C. Johnson. 21p.

A Nusselt-Reynolds number relation for cylindrical thermocouple wires in crossflow was obtained from the experimental determination of time constants. Tests were conducted in exhaust gas over a temperature range of 2000 to 3400°R, a Mach number range of 0.3 to 0.8, and a static-pressure range from $^2/_3$ to $1^1/_3$ atmospheres, yielding a Reynolds number range of 450 to 3000. The correlation obtained is $Nu = (0.428 \pm 0.003)\sqrt{Re^*}$ with average deviations of a single observation of 8.5 percent. This relation is the same as one previously reported for room-temperature conditions. (auth)

MATERIALS TESTING

12723 DOFL-TR-452
Diamond Ordnance Fuze Labs., Washington, D. C.
THE EFFECTS OF SHORT DURATION NEUTRON RADIATION ON SEMICONDUCTOR DEVICES. W. V. Behrens and J. M. Shaull. April 10, 1957. 16p. Project 33.3-36430.

Transistors, semiconductor diodes, and solid-electrolyte batteries were exposed to short duration, high-intensity neutron radiation from a U^{235} critical assembly which was primarily a neutron source. The effect on these components was ascertained by comparing their principal parameters before and after exposure, and in several cases operating units of equipment utilizing these components were monitored during irradiation. The degree of damage to different semiconductor devices from exposure to the same level of neutron radiation varied considerably. (auth)

12724 KAPL-M-AME-9
Knolls Atomic Power Lab., Schenectady, N. Y.
USE OF TOOLING PLASTICS IN TEST SECTION FABRICATION. Charles W. Donnelly. July 22, 1957. 11p. Contract W-31-109-Eng-52. $1.80(ph OTS); $1.80(mf OTS).

PUMPS

12725 HW-51171
General Electric Co. Hanford Atomic Products Operation, Richland, Wash.
A PUMPING SYSTEM FOR GROUND-WATER AQUIFER; EVALUATION TESTS. J. R. Raymond. June 28, 1957. 10p. Contract [W-31-109-Eng-52]. $1.80(ph OTS); $1.80 (mf OTS).

A pumping system was developed that permits pumping of the project wells in order to obtain data from which aquifer coefficients may be determined. The system includes a submersible electric motor driven turbine pump, electric generator, electric cable and reel, hoisting equipment, lightweight column pipe with quick-connect couplings and associated surface piping and water measuring and control elements. The system is completely portable and does not require the use of heavy duty hoisting equipment in the setting and removing operations. Volumes up to 400 gal/min can be obtained with this system depending on depth of setting. (auth)

MINERALOGY, METALLURGY AND CERAMICS

CERAMICS AND REFRACTORIES

12726 CWR-456

Curtiss-Wright Corp. Research Div., Quehanna, Penna.
REPRODUCIBILITY OF THE MECHANICAL PROPERTIES OF CERAMIC MATERIALS. PART I. MODULUS OF RUPTURE OF HIGH PURITY ALUMINA SPECIMENS. O. W. Thomas, N. R. Wheelock, and C. A. Liedholm. Feb. 28, 1957. Decl. June 28, 1957. 30p. Contract AT(30-3)-220. $4.80(ph OTS); $2.70(mf OTS).

The notion that the properties of ceramic materials vary erratically has been widely accepted. If this view were correct, attempts to develop reliable design criteria for ceramic structures subject to rigid weight limitations and exacting performance requirements could not succeed. Modulus of rupture and thermal shock test data on dense Al_2O_3 specimens have been obtained and analyzed with encouraging results, indicating predictable variations for the articles tested. The results of the modulus of rupture tests are presented and discussed. (auth)

12727

X-RAY EMISSION LINES OF Kβ GROUP OF TITANIUM IN CARBIDES. E. E. Vainshtein and Yu. N. Vasil'ev. Doklady Akad. Nauk S.S.S.R. 114, 741-4(1957) June 1. (In Russian)

The emission lines of the Ti x-ray spectrum Kβ group in specially prepared TiC melts with 9 to 24% metalloid content were investigated. The specimens were prepared from a carbon black and TiO_2 mixture annealed in hydrogen atmosphere at 1800 to 2000°C. The results showed that the position of $K\beta_1$ and $K\beta_5$ lines in TiC (9 to 20% C) spectra remained unchanged. The Kβ line short-wave boundary also was unchanged. The distance between the Kβ″ and $K\beta_5$ line maximums in the x-ray spectra of various carbides was 7.9 ev. As a matter of fact the two lines form one emission band with two distinct maxima. The relative intensities of Kβ″ line and the long-wave maximum of the $K\beta''-K\beta_5$ band of Ti absorption in the melt increase with the increase of carbon in carbides. (R.V.J.)

12728

THERMAL CONDUCTIVITY. XIII. EFFECT OF MICROSTRUCTURE ON CONDUCTIVITY OF SINGLE-PHASE CERAMICS. F. R. Charvat and W. D. Kingery (Massachusetts Inst. of Tech., Cambridge). J. Am. Ceram. Soc. 40, 306-15(1957) Sept.

The thermal conductivity of Al_2O_3, MgO, TiO_2, and CaF_2 single crystals and single-phase polycrystalline aggregates of controlled microstructure was measured between 0° and 1000°C. The conductivity of pure single-phase dense polycrystalline aggregates agrees with that of the corresponding single crystals at temperatures below the onset of radiant-heat transfer. Small amounts of impurities and the pore geometry may considerably affect the conductivity of aggregates. (auth)

12729

PHASE RELATIONSHIPS IN THE SYSTEM ZIRCONIA–THORIA. Pol Duwez and Eugene Loh (California Inst. of Tech., Pasadena and Stanford Research Inst., Menlo Park, Calif.). J. Am. Ceram. Soc. 40, 321-4(1957) Sept.

The phase relationships in the system zirconia–thoria were investigated by x-ray diffraction and dilatometric methods. The specimens were melted in air at the focus of a solar furnace. The existence of a cubic calcium fluoride-type solid solution was established for thoria concentrations above 17.5 mole %. However, this solid solution is stable only at high temperature, and, after prolonged heating at 2000°C and at 1350°C, it decomposes into tetragonal zirconia (which during subsequent cooling undergoes the unavoidable tetragonal-monoclinic inversion) and a thoria-rich phase containing at least 99 mole % thoria. (auth)

CORROSION

12730 BW-5356

Babcock and Wilcox Co. Research Center, Alliance, Ohio.
INVESTIGATION OF HEAT EXCHANGER MATERIALS. Progress Report for July 1956. Aug. 15, 1956. 18p. Contract NObs-72167. (AD-111346).

An investigation of the susceptibility of alloys to stress corrosion in different water conditions and to general corrosion in liquid Na and the fabrication of a pressure vessel to be tested as a steaming unit are presented. (auth)

12731 CRMet-700

Atomic Energy of Canada Ltd. Chalk River Project, Chalk River, Ont.
MINUTES OF A CONFERENCE ON THE CORROSION OF ALUMINUM IN WATER AT HIGH TEMPERATURES HELD AT CHALK RIVER, ONTARIO, DECEMBER 18 AND 19, 1956. M. D. Ferrier. June 1957. 183p.

Includes Appendix I: EXPERIMENTS IN CORROSION MECHANISM ALUMINUM AT HIGH TEMPERATURES. J. E. Draley and W. E. Ruther. Dec. 1956. Revised Apr. 1957 and issued as ANL-5658. Appendix II: ALUMINA PROPERTIES. A. S. Russell. 1953. (From Alcoa Tech. Paper No. 10).

The methods used at Chalk River to measure the extent of corrosion on Al and Ni alloys exposed to water at high temperatures are given. Static corrosion tests, corrosion under flowing conditions, mechanical properties of corrosion resistant Al, and the actual mechanism of corrosion are discussed. (W.L.H.)

12732 ISC-779

Ames Lab., Ames, Iowa.
KINETICS OF THE REACTION BETWEEN MAGNESIUM AND WATER VAPOR. Dale S. Gibbs and H. J. Svec. June 1956. 38p. Contract W-7405-eng-82.

Kinetics of surface oxidation of Mg metal by water vapor in the absence of other gases was studied at temperatures of 425 to 575°C and vapor pressures up to 208 mm Hg. The influence of the reaction temperature and water vapor pressure on the rate of reaction was evaluated. Results are correlated with data on the oxidation of Mg by O_2 and other metal-gas reactions. (R.V.J.)

12733 NP-6432

Mine Safety Appliances Co., Callery, Penna.
COMMENTS OF THE CORROSION OF STAINLESS STEELS IN LIQUID AMMONIA CLEANING SOLUTIONS. Memorandum Report No. 42. J. N. Gordon, Jr. Aug. 20, 1953. Decl. Aug. 2, 1955. 2p.

As part of the liquid ammonia cleaning program, a study of the extent of corrosion of stainless steels, types 302 and 347, at room temperature (75°F) in liquid ammonia and an ammonia, ammonium chloride, and sodium monoxide solution was undertaken. (auth)

GEOLOGY AND MINERALOGY

12734 RME-1066(Rev.)

Division of Raw Materials, Denver Exploration Branch, AEC.
PRELIMINARY GEOLOGIC RECONNAISSANCE IN THE

LANCE CREEK AREA, NIOBRARA COUNTY, WYOMING. Charles P. Bromley. Oct. 21, 1955. 16p. $0.20(OTS).

A study was made of U occurrences and their stratigraphic and structural control in the Lance Creek Area. The principal U occurrences were found in conglomeratic sandstone lenses in the Oligocene White River formation. Additional U was found in coal lenses of the Paleocene Fort Union formation. Abnormal radioactivity, but not ore grade, was found in buff sandstones and thin lignitic coal seams in the Cretaceous Fox Hills formation. The principal U deposits were found in vertical fractures and in permeable, horizontal beds adjacent to these fractures in the White River formation. Geologic sections were measured at several outcrops of the White River formation in the Lance Creek area. A tentative correlation of the U-bearing sandstones within this formation was attempted within this area. (auth)

12735

EXPLORATION FOR RADIOACTIVE DEPOSITS. Walther Gerlach and Klaus Stierstadt. Atomkern Energie 2, 161-7 (1957) May. (In German)

The detection of radioactive deposits in Munich is reported. (J.E.D.)

12736

THE USE OF LEACHABLE URANIUM IN GEOCHEMICAL PROSPECTING ON THE COLORADO PLATEAU. I. THE DISTRIBUTION OF LEACHABLE URANIUM IN CORE SAMPLES ADJACENT TO THE HOMESTAKE ORE BODY, BIG INDIAN WASH, SAN JUAN COUNTY, UTAH. Heinrich D. Holland, Betty Ruth Curtiss, George E. McGill, and John A. Petersen (Princeton Univ., N. J.). Econ. Geol. 52, 546-69(1957) Aug.

Data on the concentration of leachable uranium, total uranium, beta-gamma activity, alpha activity, and petrography are presented for core samples from the vicinity of the Homestake ore body, Big Indian Wash, San Juan County, Utah. It is shown that the leachable uranium content in such cores is generally highest in the vicinity of the Chinle-Cutler contact, and that the contours of leachable uranium for this horizon outline satisfactorily the Homestake ore body and an east-west trending belt of mineralization including the Homestake and the Standard-Caluranium ore bodies. This trend is defined more precisely by data on the leachable uranium concentration than by the beta-gamma activity of the samples studied, and it is concluded that leachable uranium analyses may serve as a useful tool in exploration for uranium ore. (auth)

METALS AND METALLURGY

12737 AECU-3477

Auburn Research Foundation, Auburn, Ala.

TESTS OF SPECIAL MATERIALS. Final Report. R. E. Morris. Mar. 20, 1957. 142p. For [Oak Ridge National Lab. Contract W-7405-eng-26], Subcontract No. 547.

The study to evaluate the elastic and mechanical tensile properties in rolled Zr plate revealed that the properties varied with temperature and with direction in the plate. Fracture of diagonal specimens taken from the plate at 45° with the direction of rolling was observed to occur on a plane essentially parallel to the direction of rolling and perpendicular to the surface of the rolled plate. A new mechanical extensometer was designed, fabricated, and calibrated for use in these tests. Conventional Tuckerman strain gages were used to obtain modulus of elasticity values. New procedures, equipment, fixtures, and instruments were designed, developed, fabricated, calibrated, and used to obtain true stress-strain and nominal stress-strain data from miniature compression specimens tested at room temperature and at elevated temperatures. Graphs of modulus of elasticity versus temperature and 0.2% yield strength versus temperature were plotted for Zircaloy-2, stainless steel type 347, and Zircaloy-2 weld metal. Yield strengths obtained for Zircaloy-2 varied from 47,000 psi tension at room temperature to 12,900 psi at 800°F, and modulus of elasticity values varied from 14.2×10^6 psi at room temperature to 6.8×10^6 psi at 800°F. Design curves for cylindrical and spherical Zircaloy-2 vessels under external pressure were plotted. Equipment, fixtures, and instruments developed for this testing program are believed to be sensitive, accurate, and useful for tests on standard specimens tested in compression or tension, from room temperature to 1600°F. (auth)

12738 AECU-3556

Massachusetts Inst. of Tech., Cambridge, Mass.

PHYSICAL METALLURGY OF UNCOMMON METALS. John T. Norton, Robert E. Ogilvie, and Albert R. Kaufmann. May 15, 1957. 17p. Contract AT(30-1)-981. $3.30(ph OTS); $2.40(mf OTS).

The magnetic susceptibility of UMn_2 and the magnetic hysteresis shift of UMn, CoO, and UH_3 were determined. A study was made of the phase diagram and the structure of intermetallic phases in the ternary system Zr–Si–B. Solubility limits and diffusion of Fe and Ni in Be primary solid solutions were determined. (J.E.D.)

12739 ANL-5753

Argonne National Lab., Lemont, Ill.

A SURVEY OF METAL SOLUBILITIES IN LIQUID ZINC. M. W. Nathans. July 1957. 72p. Contract W-31-109-eng-38. $2.00(OTS).

A program was initiated on the development of a fuel decontamination process by means of fractional precipitation from metallic zinc solution. In order to gather background material on alloy systems of interest, a literature survey of the binary phase diagrams of zinc in the zinc-rich regions (>50 a/o zinc) was undertaken, as well as the crystallography of the solid phases which are expected to precipitate from solution, the latter for purposes of identification. 79 references. (auth)

12740 BW-395

Babcock and Wilcox Co., [New York].

WELDABILITY OF THE CHROMIUM, NICKEL, MOLYBDENUM STAINLESS STEELS. Final Report. R. D. Wylie and E. W. Coleman. Mar. 1, 1956. 99p. Contract No. NObs-62314. (AD-120144).

From the results of this investigation it may be concluded that the 18-8 Mo type materials are satisfactory for use at elevated temperature, providing certain precautions are taken. In general, it is desirable to keep the ferrite-forming elements such as Cr, Mo, and Nb to a minimum in order that the best combination of properties is obtained. The welding electrode called Croloy 16-8-2 is satisfactory for fabrication of this material for applications at temperatures below 1350°F. Temperatures above 1350°F should be avoided because of the possibility of excessive wastage due to oxidation or other forms of corrosion. The selection of 1350°F is predicated on the assumption that the corrosive media will be no worse than the oxidation rate in still air. Certain flue gas atmospheres or liquid metal media may dictate a lower temperature limit for satisfactory long-time service. It is suggested that base materials of similar composition as the 16 Cr–8 Ni–2 Mo might have a better combination of properties than any commercially available wrought material. (auth)

12741 CF-57-8-119
Oak Ridge National Lab., Tenn.
USE OF A RATE EQUATION FOR THE EXTRAPOLATION OF CREEP DATA. C. R. Kennedy and D. A. Douglas. Aug. 20, 1957. 19p. Contract [W-7405-eng-26]. $3.30 (ph OTS); $2.40(mf OTS).

A method by which Inconel-sheet creep curves can be interpolated with a high degree of accuracy from short-time tests is described. The method combines a modified Eyring rate-reaction equation and the exponential creep rate of Inconel. There are certain limitations in the use of such a procedure. The data used were obtained from creep-rupture tests of 0.060-in. thick Inconel sheet in two conditions: annealed at 1650°F and re-annealed at 2050°F. The tests were performed in an atmosphere of Ar and at temperatures of 1300, 1500, and 1650°F. The test equipment and procedures have been previously described in ORNL 2053. The creep data have been previously reported in ORNL 2264. (auth)

12742 KAPL-M-WER-4
Knolls Atomic Power Lab., Schenectady, N. Y.
THE FABRICATION OF SAMPLES FOR CRITICAL ASSEMBLY TESTS. W. E. Ray. June 25, 1957. 29p. Contract W-31-109-Eng-52. $4.80(ph OTS); $2.70(mf OTS).

Many strip samples containing high absorption cross section materials were prepared for use in a critical assembly survey of poison materials by SAR Physics. Dispersions, alloys and pure metals were fabricated by rather unusual procedures. The Eu_2O_3, Sm_2O_3, Gd_2O_3 and B^n dispersions contained poison particles ranging in size from 8 microns (average) in some samples to −40, +140 mesh size in others. The alloys were all vacuum melted. An Austenitic B^{10} stainless steel and a Cu-5 wt. % As alloy were forged and rolled successfully to 1″ wide × 16″ long × 0.1″ thick strip. Preliminary efforts to prepare Cu-5 wt. % Sb and Cu-2.5 wt. % Sb sample stock by similar techniques were unsuccessful. The analytical chemistry data and metallographic results reported are fragmentary. (auth)

12743 NBS-3522
National Bureau of Standards. NBS-AEC Cryogenic Engineering Lab., Boulder, Colo.
JOINING ALUMINUM TO STAINLESS STEEL. Technical Memorandum No. 31. Morton C. Smith and David D. Rabb. Mar. 10, 1955. 19p. NBS Project 8101-20-8610. $3.30(ph OTS); $2.40(mf OTS).

Whatever its other advantages or deficiencies, any process that involves application of a molten Al alloy or Al-base solder to either stainless steel or Cu necessarily creates, on that other metal, a brittle bonding layer of intermetallic compounds. Because the chemical nature of Al cannot be changed, formation of this layer cannot be avoided if bonding is to occur at all. Therefore, for critical service involving vibration and fatigue, it is undoubtedly safest in the fabrication of joints to avoid use of molten Al or Al-base alloys, either as solders or as casting alloys. The best method to use for joining Al to stainless steel depends upon the application involved as well as the availability of equipment suitable to do that particular job. In the fabrication of transport dewars, the most satisfactory methods so far used have all involved soldering with Sn-base solders, after special pre-tinning treatments of the Al member of the joint. (auth)

12744 NGTE-M-242
Gt. Brit. National Gas Turbine Establishment, Farnsborough, Hants, England.
METHODS FOR REDUCTION OF HIGH TEMPERATURE DATA IN TERMS OF A THEORY OF DEFORMATION. K. F. A. Walles. Oct. 19, 1956. Includes Addendum, Nov. 1956. 48p.

Procedures are described for analysis of creep curves, creep rupture data, and hot fatigue data. Rapid graphical methods have been developed whose accuracy is fully adequate for data presently available. In addition to providing values of the constants in the theory they co-ordinate and summarize experimental data upon convenient graphs of stress versus a time-temperature variable from which values of e.g. strain for any combination of stress, time, and temperature within the experimental range may be immediately read by means of a sliding scale. (auth)

12745 NP-6415
Battelle Memorial Inst. Titanium Metallurgical Lab., Columbus, Ohio.
MECHANISMS IN THE OXIDATION OF TITANIUM. W. M. Albrecht. Aug. 5, 1957. 12p.

The oxidation of Ti follows four different rate laws in the range 25 to 1200°C. A protective blue-gray film is formed when the oxidation follows logarithmic, cubic, or parabolic rates at 25 to 350°C, 350 to 650°C, and 650 to 825°C, respectively. The film is principally substoichiometric rutile, which is a n-type semiconductor. The reaction proceeds by anion diffusion to the metal-film interface to produce more oxide. The controlling process depends upon which rate law is being followed. Above 825°C the reaction follows principally a linear rate, in which a nonprotective film is formed. (auth)

12746 NP-6416
Battelle Memorial Inst. Titanium Metallurgical Lab., Columbus, Ohio.
STATUS OF ELECTROPLATED TITANIUM COATINGS ON OTHER METALS AND ELECTROFORMED TITANIUM. John G. Beach. Aug. 30, 1957. 5p.

Electroplated Ti coatings on other metals and Ti electroforms were produced in the laboratory. Deposition of Ti coatings was done in fused-salt baths only. The required high temperatures, 800 to 1000°C, and protective atmosphere, such as Ar or He, are relatively costly. Thus a low-cost Ti coating method is not yet available. The temperature required for Ti coatings in fused-salt baths results in diffusion of the coating and the base metal. This diffusion has aided bonding, but the alloys formed at the interface depend on the base metal and might be brittle and not withstand much deformation. Application of Ti coatings now is limited to those metals that are not damaged by fused-salt-bath temperatures in the range of 800 to 1000°C, and that do not form weak diffusion alloys with the Ti, and to needs that can justify the cost and problems of working with fused-salt electrolytes. (auth)

12747 TML-77
Battelle Memorial Inst. Titanium Metallurgical Lab., Columbus, Ohio.
AN EVALUATION OF THE FATIGUE PROPERTIES OF TITANIUM AND TITANIUM ALLOYS. Jerome G. Weinberg and Ivan E. Hanna. July 17, 1957. 138p. Contract AF18(600)-1375.

The available fatigue information on Ti and Ti alloys is summarized and discussed. The appendix contains in tabular and graphical form most of the existing data on Ti alloys. A number of possible areas for further study is outlined. (auth)

12748 TML-79
Battelle Memorial Inst. Titanium Metallurgical Lab., Columbus, Ohio.
STAINLESS STEEL AND TITANIUM SANDWICH STRUCTURES. W. J. Lewis, G. E. Faulkner, and P. J. Rieppel. Aug. 9, 1957. 38p.

A summary of the available information in published literature and Government research reports on stainless steel and Ti sandwich structures, and also information obtained in surveys of companies fabricating and developing sandwich structures are given. Fabrication techniques used to produce sandwich structures and methods of evaluating them are discussed. Sections are also included on the development work under way on sandwich structures. (auth)

12749 WADC-TR-54-292(Pt. III)
Climax Molybdenum Co. of Michigan, Detroit.
OXIDATION-RESISTANT COATINGS FOR MOLYBDENUM. D. V. Doane. Apr. 22, 1957. 103p. Project title: METALLURGY AND METALLIC MATERIALS. Task title: CORROSION AND HEAT RESISTING ALLOYS. Contract AF33(616)-2488.

Tests to evaluate the ductility and relative resistance to oxidation, thermal cycling, ballistic impact, and erosion were completed on specimens of unalloyed Mo and 0.5% Ti-Mo alloy coated with Al-Cr-Si sprayed-metal coating, Ni-Cr-B sprayed-metal coatings, Ni-Si-B sprayed-metal coating, composite coating of 1 and 3, electroplated Cr, electroplated Cr-Ni composite, and Ni cladding. The evaluation tests were conducted at 1800°F. Other tests included determination of ambient temperature ductility of coated Mo and oxidation tests at temperatures up to 3000°F. The reported "self-healing" characteristics of Al-Cr-Si coatings were investigated. Modifications to promising coating compositions were explored. The results of evaluation tests and auxiliary metallographic studies provided a basis for a study of the "Nature of Promising Coatings" which constitutes the final section of this report. The pertinent findings of the investigation are summarized. (auth)

12750 WAL-401/93-37
Case Inst. of Tech., Cleveland.
EFFECT OF ALPHA-BETA RATIO ON PROPERTIES OF TITANIUM ALLOYS. Final Report. R. J. Quigg, E. L. Harmon, Jr., and A. R. Troiano. Aug. 1957. 75p. DA Project 593-08-021. Contract DA-33-019-505-ORD-6.

The final properties attainable by the heat treatment of titanium-base alloys are dependent upon the following factors: the quantity and composition of the metastable beta phase retained by quenching; and the type, amount, and configuration of the transformation products induced by aging. The influence of many of these variables can be estimated by use of time-temperature-transformation diagrams, as applied to a specific metastable beta composition approximated from the equilibrium diagram. Specifically, in the titanium-vanadium alloys at least 50% of the quenched structure should be metastable beta in order to obtain any sizeable age hardening response. The greater the amount of vanadium present in this metastable beta, the more sluggish is the response. The amount and composition of beta phase is dependent upon the solution temperature and the rate of cooling. Each combination of solution temperature and cooling rate possesses a unique aging behavior. Coherent omega phase and a very fine alpha precipitate tend to strengthen the alloy. Where large amounts of metastable beta are retained by quenching, omega and a very fine alpha cannot be tolerated without embrittlement; but where less than 50% of the metastable beta phase is retained by quenching, these phases do not significantly impair ductility. A low yield to tensile ratio may result from omega formation in a structure which contained less than 50% metastable beta. Where large amounts of the metastable beta phase are retained by quenching, the best combinations of strength and ductility are usually obtained at some intermediate aging time. Overaging in all cases results in lowering of strength and raising of ductility. The alpha phase is apparently tougher than the beta phase. The greater the amount of alpha, the higher is the Charpy impact energy. Similarly, overaging improves impact properties. Strain hardening as evidenced by a high elongation to reduction in area ratio was obtained in an alloy quenched from a solution temperature where the composition of the beta phase was 16% vanadium. This strain hardening was attributed to deformation-induced transformations. (auth)

12751 WAPD-PWR-PMM-564
Westinghouse Electric Corp. Bettis [Plant], Pittsburgh.
PWR-ALTERNATE CONTROL ROD MATERIAL PROGRAM. E. F. Losco. July 15, 1956. 28p. $4.80(ph OTS); $2.70(mf OTS).

Development studies were continued on B^{10}-stainless steel systems and Cd-In-Ag alloys. Data which indicate the physical and nuclear properties of a range of systems and alloys are given. The metallurgical techniques developed for obtaining homogeneous B^{10}-stainless steel systems are noted. (D.E.B.)

12752 WAPD-PWR-PMM-654
Westinghouse Electric Corp. Bettis Plant, Pittsburgh.
PWR ALTERNATE CONTROL ROD MATERIAL PROGRAM. Period Covered: October 15 to November 15, 1956. E. F. Losco and H. J. Snyder. Nov. 15, 1956. 63p. $10.80(ph OTS); $3.90(mf OTS).

Fabrication experience and physical property data are given for B-Cu systems and Cd-In-Ag alloys. (D.E.B.)

12753 WAPD-PWR-PMM-637
[Westinghouse Electric Corp. Bettis Plant, Pittsburgh.]
OUTLINE OF PWR ALTERNATE CONTROL MATERIAL INFORMATION OBTAINED AT BETTIS. Sept. 15, 1956. 29p. $4.80(ph OTS); $2.70(mf OTS).

Data are given on the fabrication of Cu-B powder dispersions; fabrication of control rods; corrosion of stainless steel, Ag-base alloys, and Ni plated Ag-base alloys; tensile properties of Ag-base alloys; and microstructures of In-bearing alloys. (W.L.H.)

12754 AEC-tr-3047
THE VAPOR PRESSURE OF MAGNESIUM OVER ALUMINUM-MAGNESIUM ALLOYS. A. Schneider and E. K. Stoll. Translated by D. E. Cardamone from Z. Elektrochem. 47, 519-26(1941). 13p.

TRACER APPLICATIONS

12755
THE USE OF RADIOISOTOPES IN HYDROLOGY. II. A METHOD FOR DETERMINING THE ABUNDANCE IN GROUND WATER STREAMS. Heribert Moser, Ferdinand Neumaier, and Werner Rauert. Atomkern Energie 2, 225-31(1957) June. (In German)

The principle problem of hydrological measurement of the water closure consists in the determination of the amount of ground water streams in an unretarded state. (tr-auth)

PHYSICS

12756 AECU-3557
Vitro Corp. of America, New York.
INDUSTRIAL STERILIZATION MACHINE VS FISSION PRODUCT SOURCE COST STUDY. Job 24-A. Lawrence

E. Crean, Morris Papish, and Frederich Fahnoe. Jan. 30, 1953. 19p. Contract AT(30-1)-850. $4.80(ph OTS); $2.70(mf OTS).

A study has been made of the costs of commercial electron accelerators with the objective of estimating the cost of mixed fission product sources when competing with accelerators as a means of industrial sterilization of foods and other products. The assumption was made that the fission product sources would contain highly concentrated fission salts having a specific activity of 10,000 curies per pound. (auth)

12757 KAPL-1674

Knolls Atomic Power Lab., Schenectady, N. Y.

MECHANISM OF THE DIFFUSION OF HYDROGEN THROUGH ACTIVE AND INACTIVE PALLADIUM. O. N. Salmon, D. Randall, and E. A. Wilk. Nov. 1, 1956. 56p. Contract W-31-109-Eng-52. $0.40(OTS).

The important rate-determining mechanisms have been postulated, and the rate equations deduced from these mechanisms have been verified to a considerable degree by the study of the steady-state rate of diffusion of hydrogen. These experiments have been performed through flat palladium membranes (0.0025 to 0.020 in. thick) at upstream hydrogen pressure P_1 (up to 50 cm Hg) and at essentially zero downstream hydrogen pressure, and at a membrane temperature of 300 to 600°C. The frequently observed inactivity of palladium relative to hydrogen diffusion is due to surface impurities occupying ordinarily active sites on the palladium surface and/or to small true surface area of palladium due to lack of surface roughness. (auth)

12758 NYO-7693

New York Univ., New York. Atomic Energy Commission Computing Facility.

ON THE STRUCTURE OF A STEADY HYDROMAGNETIC SHOCK, ONE-FLUID THEORY. Marian H. Rose. Oct. 1956. 27p. Contract AT(30-1)-1480. $4.80(ph OTS); $2.70(mf OTS).

The structure of a plane, steady hydromagnetic shock is studied from the point of view of one-fluid continuum theory. Viscosity and heat conductivity are neglected; the electrical conductivity may have any value. The purpose is to derive expressions for the shock profile and thickness in terms of the parameters that enter into the equations of motion of the fluid. (auth)

12759 SCL-T-139

A RELATIONSHIP BETWEEN HYSTERESIS COEFFICIENT AND PERMEABILITY. PART III. FERRITE NUCLEI WITH RECTANGULAR LOOP. PART IV. INFLUENCE OF THE COERCIVE FORCE. (Eine Beziehung zwischen Hysteresebeiwert und Permeabilitat. Teil III. Ferritkerne mit Rechteckschleife. Teil IV. Einfluss der Koerzitivkraft.) M. Kornetzki. Translated from Z. angew. Phys. 8, 127-35(1956). 19p.

12760

DETERMINATION OF AN ABSOLUTE PAIR PRODUCTION CROSS SECTION BY RELATIVE MEASUREMENTS. V. Shkolnik and S. Standil (Univ. of Manitoba, Winnipeg). Can. J. Phys. 35, 1156-8(1957) Sept.

A method which involves only relative measurements was used to determine an absolute cross section for the pair production process in Pb at 1.12 Mev. The experimental errors are reduced by a factor of four over previous methods. (L.T.W.)

12761

MEASUREMENT OF THE PRODUCT OF VISCOSITY AND DENSITY OF LIQUID HELIUM WITH A TORSIONAL CRYSTAL. Benjamin Welber (Lewis Flight Propulsion Lab., Cleveland, Ohio) and S. L. Quimby (Columbia Univ., New York). Phys. Rev. 107, 645-6(1957) Aug. 1.

The product of the viscosity and the density of liquid helium in the range 1.3 to 4.2°K has been measured with a quartz crystal cylinder performing torsional oscillations at 32.4 kc/sec. The measurements are found to be independent of velocity over a wide range. (auth)

12762

HEAT CAPACITY OF PALLADIUM BELOW 4.2°K. John P. Rayne (Westinghouse Research Labs., Pittsburgh). Phys. Rev. 107, 669-70(1957) Aug. 1.

Heat capacity measurements below 4.2°K have been made on extremely pure palladium. The resulting values of electronic heat capacity and Debye temperature differ from previous work, it being found that $\gamma = (9.87 \pm 0.11) \times 10^{-4}$ joule $mole^{-1}$ deg^{-2} and $\theta = 299 \pm 12$°K. The effects of changes in the physical and chemical state of the specimen have been investigated with a view to understanding the discrepancies between the various determinations of the low-temperature atomic heat of palladium. (auth)

12763

MEASUREMENTS OF LARGE-ANGLE SINGLE COLLISIONS BETWEEN HELIUM, NEON, AND ARGON ATOMS AT ENERGIES TO 100 kev. E. N. Fuls, P. R. Jones, F. P. Ziemba, and E. Everhart (Univ. of Connecticut, Storrs). Phys. Rev. 107, 704-10(1957) Aug. 1.

Single collisions between ions and atoms have been studied at 25, 50, and 100 kev energies for the cases He^+ on He, He^+ on Ne, He^+ on Ar, Ne^+ on Ne, Ne^+ on Ar, and Ar^+ on Ar. The incident ion beam traversed a collision chamber containing a target gas whose pressure was maintained low enough to insure single interactions. The particles, which were scattered at each angle from four to forty degrees, passed through a pair of collimating holes with a resolution width of one degree. An electrostatic analyzer and its associated detectors determined the number of scattered atoms in each state of charge, ranging from zero to seven times ionized. The percentages of the various charge states in the scattered beam are plotted in order to indicate the dependence of this quantity on scattering angle and energy for each of the systems studied. The differential cross section for the scattering of particles has also been measured in each case and compared with values calculated classically from a Coulomb potential energy function modified by exponential screening. (auth)

12764

ABSOLUTE ENERGY TO PRODUCE AN ION PAIR BY BETA PARTICLES FROM S^{35}. William P. Jesse (St. Procopius Coll., Lisle, Ill.) and John Sadaukis (Argonne National Lab., Lemont, Ill.). Phys. Rev. 107, 766-71(1957) Aug. 1.

The absolute average energy W_β necessary to form an ion pair in nitrogen, ethylene, and ethane was determined for S^{35} beta particles by the use of a sample assayed in a 4π counter. The total number of ions produced per second for each gas was determined by a measurement of total ionization in a chamber. The average energy per beta particle was calculated from the known shape of the distribution curve for S^{35}. Corrected values of W_β were found to be 35.3, 26.2, and 24.7 ev/ion pair for N_2, C_2H_4, and C_2H_6, respectively. These values yield a corresponding value for air of 34.1 ev/ion pair. All these are in excellent agreement with values previously predicted from relative beta- and alpha-ray measurements in various gases. (auth)

12765

ANGULAR DISTRIBUTION OF FRAGMENTS FROM THE FISSION OF BISMUTH BY 450-Mev PROTONS. Robert L.

Wolke and Joel R. Gutmann (Univ. of Chicago, Ill.). Phys. Rev. 107, 850-5(1957) Aug. 1.

The angular distributions of three fragments from the 450-Mev proton-induced fission of Bi have been measured by a recoil-catching technique involving radiochemical separation of the fission products. The forward velocity component of the fissioning nucleus was determined relative to the velocity of each fragment. If it is assumed that the motion of the fissioning nucleus is directed along the proton axis, the angular distributions in the system of the fissioning nucleus are found to be of the form $a + b\cos^2\theta'$, with values of b/a of 0.10 ± 0.01, 0.115 ± 0.015, and 0.09 ± 0.01 for $Ga^{71,73}$, $Sr^{91,92}$, and $Cd^{115,117}$, respectively. The possibility that the motion of the fissioning nucleus is directed at an angle to the proton axis is discussed. (auth)

12766

NUCLEAR RELAXATION IN SUPERCONDUCTING ALUMINUM. L. C. Hebel and C. P. Slichter (Univ. of Illinois, Urbana). Phys. Rev. 107, 901-2(1957) Aug. 1.

12767

THE CONVERGATRON, A NEUTRON AMPLIFIER. Lyle B. Borst (New York Univ.). Phys. Rev. 107, 905-6(1957) Aug. 1.

The Convergatron is a neutron amplifier consisting of three zones per stage: fissionable fuel zone (with or without moderator), a thermal neutron barrier, and a neutron moderator zone. If arranged in a series sequence, the polar properties permit neutron flow from fuel through the barrier and moderator to the next fuel zone. Neutrons moving in the reverse direction are moderated and absorbed by the thermal neutron barrier so that flow is inhibited. (L.T.W.)

12768

THE EFFECT OF UNIFORM COMPRESSION UPON THE MAGNETIC PROPERTIES OF BISMUTH AT LOW TEMPERATURES. B. I. Verkin, I. M. Dimitrenko, and B. G. Lazarev (Academy of Sciences, Ukrainian SSR). Soviet Phys. JETP 4, 432-4(1957) Apr.

12769

OBTAINING POLARIZED ELECTRON BEAMS. L. N. Rosentsveig (Academy of Sciences, USSR). Soviet Phys. JETP 4, 455-6(1957) Apr.

The production of a polarized electron beam by field emission from a cathode to whose surface is applied a strong electric and magnetic field is described. (L.T.W.)

COSMIC RADIATION

12770 AEC-tr-3002

Argentina. Comisión Nacional de Energía Atómica. Laboratorio de Radiación Cósmica.

MEASUREMENTS OF THE INTENSITY OF COSMIC RADIATION IN THREE LATITUDES OF ARGENTINA. Translated by G. E. Denegar. 1957. 4p.

12771 AEC-tr-3003

Argentina. Comisión Nacional de Energía Atómica, Buenos Aires.

ON THE ABSORPTION OF THE NUCLEONIC COMPONENT OF THE COSMIC RADIATION AT −15° GEOMAGNETIC LATITUDE. Juan G. Roederer. Translated by G. E. Denegar. [1957]. 4p.

12772

THE DEPENDENCE OF THE EMISSION FREQUENCY OF SHOWER PARTICLES ON THE ATOMIC NUMBER OF THE SPALLATED NUCLEUS. Zh. S. Takibaev. Doklady Akad. Nauk S.S.S.R. 114, 980-3(1957) June 11.

Filaments of W and Al pressed between thick photoplate layers were exposed in the stratosphere at an elevation of 28 km. Distributions of stars formed in W and Al were measured by the number of thin and dense tracks. Data showed that shower particles appear more frequently in stars formed in the W than in the Al. A collision of the incoming particle with the W nucleus produced 1.13 ± 0.12 shower particles, while the collision with the Al nucleus produced only 0.48 ± 0.08. Analysis of star distributions formed in various elements at elevations from 4000 to 4400m and in the stratosphere supported the conclusion that the number of emitted fast protons (with energies from 50 to 500 Mev) increases with the increased atomic number of the spallated nucleus. (R.V.J.)

12773

ON HEAVY PRIMARY CASCADES. R. R. Hillier and C. J. Waddington (H. H. Willis Physical Lab., Bristol, Eng.). Nuovo cimento (10) 6, 403(1957) Aug.

Several cases have been reported of the observation in nuclear emulsions of multiple disintegrations produced by heavy primary cosmic ray nuclei and distinguished by having anomalously short mean free paths. Apparently, however, these events do not represent any abnormal behavior of the heavy nuclei in the cosmic radiation, but have been observed because of the highly biased sample of events recorded by a detector of limited dimensions. (M.H.R.)

12774

THE CHARGE DISTRIBUTION OF MULTIPLY CHARGED NUCLEI IN THE PRIMARY COSMIC RADIATION. PART I. THE LIGHT AND MEDIUM NUCLEI. C. J. Waddington (H. H. Wills Physical Lab., Bristol). Phil. Mag. (8) 2, 1059-78(1957) Sept.

The charge distribution of multiply charged nuclei in the cosmic radiation with charges of less than ten has been investigated with a nuclear emulsion detector. The individual charges were determined by two independent methods of ionization measurement, δ-ray counting, the charge spectra obtained from these measurements provides an important check on the reliability of the charge determinations. The fluxes of nuclei of different charge groups are given, and it is shown that the ratio of light to medium nuclei at a mean depth in the atmosphere of 15 g/cm² is 0.47 ± 0.07, while at the top of the atmosphere it is 0.37 ± 0.07. These results are compared with those obtained by earlier workers. The use of charge indicating interactions in the calibration of the charge measurements is discussed in an Appendix. (auth)

12775

ACCELERATION OF COSMIC RAYS IN SOLAR FLARES. E. N. Parker (Univ. of Chicago, Ill.). Phys. Rev. 107, 830-6(1957) Aug. 1.

It is shown that the white-light cosmic-ray solar flare of February 23, 1956 expended of the order of 2×10^{32} ergs of energy, or 10^4 ergs/cm³. The energy apparently came from a 500-gauss force-free magnetic field initially occupying the site of the flare. It is shown that the 500-gauss field, besides supplying the flare energy, will produce fluid motions of sufficient velocity to accelerate ions from thermal to relativistic energies by Fermi's mechanism in about 2 minutes. The theoretical energy spectrum of the model is in agreement with the observed spectrum. About one percent of the total flare energy is converted to relativistic particles and the remainder is dissipated through thermal processes to produce the observed optical radiation. (auth)

12776

ON THE COMPOSITION OF PRIMARY COSMIC RAYS. V. L. Ginzburg and M. I. Fradkin (P. N. Lebedev Physical Inst.). Soviet Phys. JETP 4, 462-4(1957) Apr.

CRYSTALLOGRAPHY AND CRYSTAL STRUCTURE

12777 KAPL-1720

Knolls Atomic Power Lab., Schenectady, N. Y.

ENERGY LEVEL CALCULATIONS FOR F-CENTERS AND INTERSTITIAL POSITIVE IONS IN ALKALI HALIDES. W. A. Smith, Jr. Apr. 1, 1957. 47p. Contract W-31-109-Eng-52. $0.35(OTS).

A self-consistent quantum mechanical method was used to calculate energy levels of electrons trapped by negative ion vacancies and by interstitial positive ions in the halides of Li, Na, K, and Rb. The optical excitation energies predicted by the theory were compared with experimental values from optical absorption spectra and with the theoretical values obtained by other investigators. The agreement between theory and experiment is the best yet reported. Qualitative evidence is presented that one of the absorption bands (the N-band) observed in the near infrared absorption spectra of colored KCl and KBr may be ascribed to the presence of interstitial positive ions. (auth)

12778 AEC-tr-3044

CRYSTAL STRUCTURE OF Th_2Zn_{17} AND U_2Zn_{17}. E. S. Makarov and S. I. Vinogradov. Translated by L. Hanka from Kristallografiya 1, 634-43(1956). 17p.

Results of x-ray studies of single crystals provided a complete determination of crystal structure of Th_2Zn_{17} and U_2Zn_{17} which are related to new structural types. (auth)

ELECTRICAL DISCHARGE

12779 AERE-N/M-27

Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.

A VELODYNE INTEGRATOR. W. G. L. Brownrigg. Feb. 15, 1949. 5p.

An electro-mechanical integrator is described which was designed for the integration of voltage signals. The integrator was designed to have a constant sensitivity, and can be used for integrating voltages in the range ± 0.3 to ± 100 v. (C.H.)

12780 TID-7536(Pt. 1)

Division of Research. Controlled Thermonuclear Branch, AEC.

CONTROLLED THERMONUCLEAR REACTIONS. A CONFERENCE HELD AT BERKELEY, CALIFORNIA, FEBRUARY 20-23, 1957. Sept. 1957. 44p. $1.25(OTS).

Eleven papers are included which present the various methods used in theoretical investigations of plasma behavior. (D.E.B.)

12781

ON THE PULSATION OF PLASMA IN A CYLINDER. A. G. Kulikovsky (Lomonosov Moscow State Univ.). Doklady Akad. Nauk S.S.S.R. 114, 984-7(1957) June 11. (In Russian)

12782

OSCILLATIONS OF AN INFINITE SELF-GRAVITATING GAS CYLINDER IN THE PRESENCE OF MAGNETIC FIELDS. I. M. Yavorskaya (Lomonosov Moscow State Univ.). Doklady Akad. Nauk S.S.S.R. 114, 988-90(1957) June 11. (In Russian)

ELECTRONS

12783 NYO-8015

Princeton Univ., N. J. Palmer Physical Lab.

AN EXPERIMENT ON THE STRUCTURE OF THE ELECTRON. [PART] I. G. K. O'Neill and J. A. Ball. July 18, 1957. 19p. Contract AT(30-1)-937, Scope II. $3.30 (ph OTS); $2.40(mf OTS).

Quantum electrodynamics has so far not been tested in the limit of very short distances. Such a test could be made by scattering electrons on electrons at center of mass energies of several hundred Mev. A design for such an experiment, making use of an existing linear accelerator and two electron storage rings, is described. The results of calculations on some of the experimental problems are given. (auth)

12784

THE MODEL OF THE ELECTRON. M. Skorko and E. Skorko (Physical Lab. of the Inst. of Tech., Łódź, Poland). Nuovo cimento (10) 6, 364-6(1957) Aug.

The proposed model of the electron consists of a magnetic disk rolling without sliding having radius "r", uniformly distributed mass "m" and a "point" charge "e" on the periphery of the disk. Conclusions permitted by a model are reviewed. (M.H.R.)

12785

ON THE LONGITUDINAL POLARIZATION OF β-PARTICLES. P. E. Cavanagh, J. F. Turner, C. F. Coleman, G. A. Gard, and B. W. Ridley (Atomic Energy Research Establishment, Harwell). Phil. Mag. (8) 2, 1105-12(1957) Sept.

Longitudinal polarization of β particles as a consequence of nonconservation of parity has been demonstrated conclusively. Some of the problems which lie in the way of an accurate determination of the polarization have been investigated. The value obtained for the degree of polarization is an agreement with the two-component theory of the neutrino, and the sign indicates that the β particles are emitted with backward pointing spins. (auth)

12786

RADIATIVE CORRECTIONS TO THE SCATTERING OF ELECTRONS BY ELECTRONS AND POSITRONS. R. V. Polovin (Academy of Sciences, Ukrainian SSR). Soviet Phys. JETP 4, 385-92(1957) Apr.

The radiative corrections to the scattering of electrons and positrons are calculated with accuracy up to α^3. Consideration is given to the general case and the limiting case of large energies. (auth)

12787

TRANSFORMATION PROPERTIES OF THE ELECTRON-POSITRON FIELD AMPLITUDES. Iu. A. Gol'fand (Academy of Sciences, USSR). Soviet Phys. JETP 4, 446-7(1957) Apr.

GASES

12788 AFSWC-TR-56-34

National Bureau of Standards, Washington, D. C.

THERMODYNAMIC FUNCTIONS FOR ATOMIC IONS. Harold W. Woolley. Apr. 1957. 113p. Project 5776. (AD-96302).

The calculation of equilibrium thermodynamics properties of a chemically reacting mixture of gases at such high temperatures that ionic forms are appreciably present is discussed with special consideration of cluster theory. A method of calculation of approximate thermodynamic functions for atoms and atomic ions at very high temperature is presented, involving the use of distinct observed lower energy states, with average quantum defects allowing effects of both observed and unobserved higher states to be included. The ideal-gas thermodynamic quantities have been computed for the neutral atoms and all of the positive ions of hydrogen, carbon, nitrogen and

oxygen; for the first seven ions of argon, and for the negative ions of oxygen and hydrogen. (auth)

12789 K-1302(Pt. 3 (Add.))
Oak Ridge Gaseous Diffusion Plant, Tenn.
THE PROBLEM OF KNUDSEN FLOW. PART III. SOLUTIONS FOR ONE-DIMENSIONAL SYSTEMS. (Addendum). W. C. DeMarcus. Sept. 12, 1957. 7p. Contract W-7405-eng-26. $1.80(ph OTS); $1.80(mf OTS).

12790 UCRL-4861
California. Univ., Livermore. Radiation Lab.
PROPERTIES OF AN IONIZED GAS OF LOW DENSITY IN A MAGNETIC FIELD. [PART] III. Allan N. Kaufman and Kenneth M. Watson. Mar. 1957. 26p. Contract W-7405-eng-48. $4.80(ph OTS); $2.70(mf OTS).

The hydrodynamic properties of an ionized gas in a strong magnetic field are developed. It is assumed that effects of particle-particle collisions are negligible, thus restricting the discussion to motions which develop in times short compared to thermalization time. As in the method of Chapman and Enskog, the hydrodynamic equations must be supplemented by the Boltzmann transport equation. Because of the assumed strong magnetic field, however, the Boltzmann equation is reducible to a one-dimensional equation, describing particle motions along the magnetic field lines. (auth)

INSTRUMENTS

12791 AD-112460
General Electric Co. Specialty Transformer Dept., Fort Wayne, Ind.
ULTRA HIGH TEMPERATURE MINIATURIZED POWER TRANSFORMERS AND INDUCTOR MATERIALS. Scientific Report No. 1 [for] First Quarter, May 1–July 31, 1956. H. B. Harms. 128p. Contract AF33(616)-3623.

Research and development are presented in the field of insulating, conductive, and magnetic materials and construction techniques for power-type electronic transformers and inductors capable of operation in a maximum 500°C ambient temperature and in nuclear radiation ambients of 10^{11} fast neutrons/cm^2/sec and 10^{13} gamma photons/cm^2/sec. Other adverse environments specified include severe vibration and shock as well as moisture resistance and thermal cycling. An ambient air density corresponding to 100,000 ft altitude is also specified. The first quarterly report for this contract describes the technical approach and detailed plans designed to accomplish the development within the time contracted for. The development encompasses an evaluation of basic transformer materials and their simple combinations while exposed to high temperatures and nuclear radiation as well as process developments and structural designs to impart necessary physical protection to the basic materials. Certain preliminary results are presented. The outcome of an earlier investigation sponsored as part of an Air Force sub-contract to demonstrate feasibility has been made a part of this report. (auth)

12792 AD-122333
General Electric Co. Specialty Transformer Dept., Fort Wayne, Ind.
ULTRA HIGH TEMPERATURE MINIATURIZED POWER TRANSFORMERS AND INDUCTOR MATERIALS. Scientific Report No. 2 [for] Second Quarter, August 1–October 31, 1956. H. B. Harms, E.A. Weaver, and W. R. Langdon. 114p. Contract AF33(616)-3623.
(For preceding period see AD-112460.)

12793 AD-126225
General Electric Co. Specialty Transformer Dept., Fort Wayne, Ind.
ULTRA HIGH TEMPERATURE MINIATURIZED POWER TRANSFORMERS AND INDUCTOR MATERIALS. Scientific Report No. 3 [for] Third Quarter, November 1, 1956–January 31, 1957. H. B. Harms. 118p. Contract AF33(616)-3623.

Results of the temperature evaluation of materials and systems are reported. Progress made in the process development and structural design phases and in the combined temperature and nuclear radiation evaluations of materials and systems is presented. (For preceding period see AD-122333.) (W.L.H.)

12794 CF-57-7-123
Oak Ridge National Lab., Tenn.
APPARATUS FOR DETERMINING LINEAR THERMAL EXPANSIONS OF MATERIALS IN VACUUM OR CONTROLLED ATMOSPHERES. S. D. Fulkerson. July 30, 1957. 24p. Contract [W-7405-eng-26]. $4.80(ph OTS); $2.70(mf OTS).

An apparatus is described for determining linear thermal expansion of materials in vacuum or controlled atmospheres. (W.L.H.)

12795 DP-203
Du Pont de Nemours (E. I.) & Co. Savannah River Lab., Augusta, Ga.
THE GAUGING OF PARALLEL MEMBRANES WITHIN LONG TUBES. Leslie E. Goodwin. Feb. 1957. 12p. Contract AT(07-2)-1. $0.15(OTS).

An instrument is described that measures the separation between two parallel aluminum membranes inside an aluminum tube over ten ft long. Linear variable differential transformers are used as the "sensing" elements. The separations near both pairs of edges of the membranes are indicated simultaneously as the gage is pushed through the tube. Variation from the nominal separation is indicated on zero-center microammeters. The testing of the tube requires less than 10 min. The separation is measured with an accuracy of ± 0.001 in. (auth)

12796
ADAPTATION OF A SPECTROMETER AS AN ABSOLUTE PULFRICH REFRACTOMETER. William Primak (Argonne National Lab., Lemont, Ill.). Anal. Chem. 29, 1237-9(1957) Aug.

12797
ELECTRONICS AND NUCLEAR PHYSICS. PRINCIPLES OF CONSTRUCTION OF LINEAR AMPLIFIERS. Robert Genin. Paris, Hermann and Cie, 1953. 154p. (In French)

The principles of design and construction of linear amplifiers for the signals from ionizing radiation detectors and particularly ionization chambers are given. (T.R.H.)

ISOTOPES

12798 NP-6401
Amsterdam. Universiteit.
PRODUCTION OF RADIOISOTOPES WITH CHARGED PARTICLES (thesis). Herman Hendrik Philip Moeken. July 1957. 82p.

ISOTOPE SEPARATION

12799 K-1341
Oak Ridge Gaseous Diffusion Plant, Tenn.
LOSS IN PRODUCTION DUE TO PERIODIC FEED CON-

CENTRATION. D. W. Burton. Sept. 12, 1957. 61p. Contract Contract W-7405-eng-26. $1.75(OTS).

Losses in production result when the plant operating variables undergo transient or periodic changes in their values. The loss in production of the plant when the feed concentration to a simple series-type plant undergoes a periodic variation is calculated and compared to a more exact result for a square-type plant, but with a 100 stage stripper added. Numerical evaluation of the loss is carried through for a few cases. (auth)

MASS SPECTROGRAPHY

12800 Y-1173

Union Carbide Nuclear Co. Y-12 Plant, Oak Ridge, Tenn.
A MASS SPECTROMETER SURFACE IONIZATION SOURCE FOR USE WITH A VACUUM LOCK. Richard E. Sladky. July 24, 1957. 13p. Contract W-7405-eng-26. $0.20 (OTS).

A surface ionization source was designed and built to be used with a mass spectrometer equipped with a vacuum. (auth)

12801

A NEW IMPULSE TECHNIQUE FOR ION MASS MEASUREMENTS. S. G. Alikhanov. Soviet Phys. JETP 4, 452-3 (1957) Apr.

MATHEMATICS

12802 DP-212

Du Pont de Nemours (E. I.) & Co. Savannah River Lab., Augusta, Ga.
STRESSES IN RINGS. John W. Walker. June 1957. 16p. Contract AT(07-2)-1. $0.20(OTS).

The strain-energy method is used to derive equations for calculating moments and forces in an elastic ring that is subjected to equal uniformly spaced loads. The more elementary analysis for thin rings neglects direct forces and introduces large errors in the calculations of moments, forces, and stresses if the ring is subjected to more than five loads. (auth)

12803 K-1345

Oak Ridge Gaseous Diffusion Plant, Tenn.
A SPECIAL PURPOSE SLIDE RULE FOR COMPUTING SOLID ANGLES. J. R. Knight. Sept. 19, 1957. 15p. Contract W-7405-eng-26. $0.50(OTS).

The design and construction of a slide rule for calculating the solid angle subtended by a rectangle at a point located on a line perpendicular to the center of the rectangle are described. The application of the solid angle to the evaluation of safe spacing between individually subcritical containers of fissionable material is discussed, and a complete derivation of the solid-angle equation and a table of values used in marking the slide rule scales are given. (auth)

12804 KAPL-M-JA-4

Knolls Atomic Power Lab., Schenectady, N. Y.
TOSPY: A 2-DIMENSIONAL MULTIGROUP PROGRAM FOR THE UNIVAC TOSPY INPUT. Julius A. Archibald, Jr. May 1, 1957. 34p. Contract W-31-109-Eng-52. $6.30(ph OTS); $3.00(mf OTS).

12805 SCTM-173-57(14)

Sandia Corp., Albuquerque, N. Mex.
A COMPUTER SYSTEM FOR SIMULTANEOUS MEMORY RECALL. Michael Barry Marcus. June 1, 1957. 33p. Contract AT(29-1)-789. $6.30(ph OTS); $3.00(mf OTS).

The results of theoretical studies on SLAC (or MDA) systems are reported. These systems are parallel retrieval memories useful in library, computing, or similar applications. (auth)

12806 WAPD-TM-68

Westinghouse Electric Corp. Bettis Plant, Pittsburgh.
LOGIC — A FLUX DATA PROCESSING CODE FOR THE IBM-650. Betty L. Anderson. June 1957. 13p. Contract AT-11-1-GEN-14. $0.50(OTS).

LOGIC is an IBM-650 code designed to use fixed point flux data to perform either a least squares log fit or to punch out from one to three decks of cards to be used as input to COFIT or EXFIT codes. From 2 to 300 points of observed data may be used to fit a function of the form $\ln y = A + Bx$ by a standard least squares method. Three problems of this type may be solved, under certain restrictions, in one pass of the data cards through the 650. A maximum of 500 points may be used to provide input to the COFIT and EXFIT codes. Typical computing and punching time for three log fitting problems of 10, 9, and 8 points and three card punching problems of 14, 9, and 13 points is 3 min. (auth)

MEASURING INSTRUMENTS AND TECHNIQUES

12807 AECU-3486

Illinois Inst. of Tech., Chicago. Armour Research Foundation.
EFFICIENCY OF SCAVENGING DEVICES USED IN DETERMINING FALLOUT. Scientific Report No. 1. (Report No. 4). Jan Rosinski. Jan. 25, 1957. 130p. ARF Project No. C-082. Contract AT(11-1)-375. $0.65(OTS).

The study of scavenging devices used in determining radioactive fall-out was limited to the evaluation of the gummed paper collector. Sampling under rainless conditions was examined quantitatively as a function of adhesiveness, exposure to ultraviolet radiation, humidity, wind velocity, and electrostatic effects. Scavenging was found to be a complicated function of wind velocity and humidity, with electrostatic effects as a dependent variable. Adhesiveness was defined and its relationship to rebound phenomenon was examined experimentally. The equation for foreign contamination present on a gummed surface was derived and checked experimentally. Sampling during rain was found to be a function of the wettability of particulate matter, hydrophobic particles being readily deposited from raindrops. Some evidence was presented that the radioactive fall-out was hydrophilic and/or soluble in water. A general discussion of the problem is presented and recommendations are given. (auth)

12808 AF-SAM-57-70

Texas. Univ., Houston. M. D. Anderson Hospital and Texas. Univ., Houston. Tumor Inst.
TECHNIC AND DOSIMETRY FOR WHOLE-BODY X-IRRADIATION OF PATIENTS. W. K. Sinclair and A. Cole. Nov. 14, 1956. 10p.

The dosimetry of whole-body x irradiation when patient is irradiated laterally with two parallel opposing fields of x rays at 250 kv, 3 mm Cu HVL, at a dose rate of about 3.8 r/minute is discussed. The difference between whole-body exposure and whole-body dose is explained. (auth)

12809 HW-49561

General Electric Co. Hanford Atomic Products Operation, Richland, Wash.
HIGH LEVEL ALPHA AIR MONITOR. G. D. Linsey and R. A. Harvey. June 14, 1957. 21p. Contract W-31-109-Eng-52. $0.25(OTS).

A high level alpha air monitor has been designed and developed that alarms at 10,000 MPC of airborne Pu in

three minutes or 1000 MPC in thirty minutes. A standard man under these conditions will retain approximately 1% of the maximum permissible amount of insoluble Pu in the lungs tolerated during a lifetime. Future modifications of the instrument will increase the sensitivity ten-fold. (auth)

12810 IDO-16389
Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.
A NEUTRON ABSORPTION ALIGNMENT CHART. Robert G. Nisle. July 30, 1957. 5p. Contract AT(10-1)-205. $0.50(OTS).

The problem of selecting absorbing foils or monitoring wires for the measurement of neutron flux density involves the determination of the flux depression resulting from the introduction of the foil, or wire. A first approximation may be obtained by finding the absorption of a beam of neutrons in passing through such a foil. The equations are relatively simple when only thin foils are considered, and these equations may be solved easily by the use of alignment charts. The chart presented here is a composite of three charts designed to solve the three applicable equations. A variety of problems may be solved by their use to a first approximation at least. Two such examples are given. (auth)

12811 KAPL-1759
Knolls Atomic Power Lab., Schenectady, N. Y.
AN IONIZATION CHAMBER FOR THE STUDY OF PLUTONIUM HEXAFLUORIDE. J. W. Codding, Jr. Mar. 29, 1957. 31p. Contract W-31-109-Eng-52. $0.25(OTS).

Calibration data are presented for a metal-ceramic ionization chamber for use with PuF_6 and nonradioactive gases in the pressure range from 0.1 to 100 mm of Hg. Effects of secondary ionization and recombination of ion current are shown. Current-pressure relationships for radioactive and nonradioactive gases have been shown to differ, and these effects have been calculated from energy balance considerations. Mixtures of PuF_6 and F_2 have been studied; it has been shown that the saturation ion current from a mixture of these two gases is not due to a linear combination of the effects of the separate gases. (auth)

12812 WADC-TN-56-191(Pt. I)
Wright Air Development Center. Materials Lab., Wright-Patterson AFB, Ohio.
CALCULATION OF THE RADIATION DOSE DELIVERED BY BETA EMITTING ISOTOPES. PART I. POINT AND THIN PLANE SOURCES IN AIR. [Period covered] March 1956 to April 1956. Edward A. Burke. Apr. 19, 1956. 22p. Project title: MATERIALS ANALYSIS AND EVALUATION TECHNIQUES. Task title: EFFECTS OF NUCLEAR RADIATION ON MATERIALS AND PROCESSES. (AD-130864).

An empirical function was used to calculate the dosage distribution around point source beta emitters. The calculated results were found to agree with experimental measurements. (D.E.B.)

12813
OPERATING CHARACTERISTICS OF A GAS-LIQUID BUBBLE CHAMBER. F. W. Bullock, C. Dodd, C. Henderson, and G. Kalmus (Univ. Coll., London). Nuovo cimento (10) 6, 334-9(1957) Aug.

Experiments were performed to determine the effect of temperature on the sensitivity of a bubble chamber filled with various concentrations of methane gas in liquid propane. It was found that as the concentration of methane is increased the operating pressure, for any given degree of sensitivity, increases by about 0.3 atmosphere for every 1°C decrease in temperature. (auth)

12814
OBSERVATIONS OF THE OPERATION OF A HIGH PRESSURE WILSON CLOUD CHAMBER. E. Fiorini, R. Giacconi, A. E. Sichirollo, and C. Succi. Nuovo cimento (10) 6, 355-63(1957) Aug.

An overcompressed Wilson cloud chamber of a particularly simple type obtained by modifying a conventional Wilson cloud chamber is described. Phenomena connected with the overcompression have been studied and the parameters from which is deduced the recycling time reduction and the clearing efficiency of the chamber are analyzed. The conditions necessary for the realization of an overcompression cycle were determined. (auth)

12815
FLUORESCENT RESPONSE OF CsI(Tl) TO ENERGETIC NITROGEN IONS. M. L. Halbert (Oak Ridge National Lab., Tenn.). Phys. Rev. 107, 647-9(1957) Aug. 1.

The light output of a CsI(Tl) crystal was measured as a function of energy for nitrogen ions from 2.9 to 23.8 Mev, for α particles up to 5.30 Mev, and for γ rays of 73, 279.2, and 411.8 kev. The particle energy was varied with absorbing foils. The response to nitrogen ions was proportional to energy up to about 16 Mev. Above this energy a slight curvature of the response curve away from the energy axis was observed. The response to α particles was linear above about 3.5 Mev and extrapolated to ~1 Mev on the energy scale. The light output from the γ rays was proportional to their energy and parallel to the linear portion of the α-particle response. The specific fluorescence dL/dx appears to be an increasing function of the specific energy loss dE/dx. (auth)

12816
PULSE IONIZATION CHAMBER AS A DEVICE FOR SIMULTANEOUS STUDY OF THE ENERGY AND ANGULAR DISTRIBUTIONS OF CHARGED PARTICLES. B. A. Bochagov, A. A. Vorob'ev, and A. P. Komar (Kalinin Leningrad Polytechnic Inst.). Zhur. Tekh. Fiz. 27, 1575-7(1957) July. (In Russian)

MESONS

12817 NYO-2094
Rochester, N. Y. Univ.
ANGULAR DISTRIBUTION OF K^+ MESONS IN REACTION $\gamma + p \rightarrow K^+ + \Lambda^0$. A. Fujii. Aug. 30, 1957. 7p. Contract AT(30-1)-875. $1.80(ph OTS); $1.80(mf OTS).

12818
LOW ENERGY $\bar{K}$-NUCLEON SCATTERING. D. Amati and B. Vitale. Nuovo cimento (10) 6, 261-5(1957) Aug.

The s-wave low energy scattering of $\bar{K}$ mesons on nucleons is studied using a similar method as that applied, in a previous work, for the K-N interaction. Disregarding virtual barion-antibarion pair effects, K virtual state contributions and barion recoil, the integral equations for the two isobaric spin state amplitudes are exactly solved, and analytical expressions for the phase shifts are given. Results are rather independent on the cut-off energy and indicate repulsive potential for both isobaric spin eigenstates. Numerical results are presented for the values of the coupling constants suggested in the previous work. (auth)

12819
OBSERVATIONS OF THE $\pi^+ \rightarrow \mu^+ \rightarrow e^+$ ANGULAR CORRELATION IN NUCLEAR EMULSION. D. Fournet Davis, A. Engler, C. J. Goebel, T. F. Hoang, M. F. Kaplon, J. Klarmann (Univ. of Rochester, N. Y.). Nuovo cimento (10) 6, 311-18(1957) Aug.

The asymmetry coefficient characterizing the angular

correlation in the π-μ-e decay has been measured in emulsion as 0.19 ± 0.06 for a sample of π^+-mesons produced at the Brookhaven Cosmotron. A discussion is given concerning depolarization effects in nuclear emulsion. (auth)

12820

POLARIZATION OF ELECTRONS FROM μ-e DECAY. H. Überall (Univ. of Liverpool). Nuovo cimento (10) 6, 376-7(1957) Aug.

To examine the polarization of electrons from μ-e decay, the Hamiltonian of Lee and Yang was used for the process and the probability of the muon decaying into a right-handed neutrino, its antiparticle, and an electron of given spin orientation was calculated. (M.H.R.)

12821

PION-NUCLEON S-WAVES AND K-MESONS. P. Budini, N. Dallaporta, and L. Fonda. Nuovo cimento (10) 6, 380-2(1957) Aug.

The hypothesis that the pion interacts with the nucleon through a heavy meson field is in principle apt to furnish a physical basis for a dynamic interpretation of a non local pion-nucleon interaction. If K mesons are taken to represent the internal meson field the dimensions of the nuclear source for π mesons is of the order of magnitude of that required to explain P-wave pion-nucleon scattering in PS-PV static theory. The implications of the dynamic model of the extended source proposed by Budini and Fonda are examined in other phenomena also, such as pion-nucleon S wave scattering. (auth)

12822

TIME REVERSAL AND THE DECAY OF THE μ-MESON. D. J. Candlin (Univ. of Cambridge, Eng.). Nuovo cimento (10) 6, 390-1(1957) Aug.

12823

INFORMATION ON THE NATURE OF HEAVY MESONS FROM PHOTOPRODUCTION EXPERIMENTS. D. Amati and B. Vitale. Nuovo cimento (10) 6, 395-7(1957) Aug.

It is pointed out that photoproduction processes of K mesons can give a reliable answer to the problem of relative parity. Other information about K-N interaction can be extracted from the experimental data by using only conservation laws and charge independence hypothesis. (M.H.R.)

12824

POLARIZATION OF μ-MESONS OBSERVED IN A PROPANE BUBBLE CHAMBER. Margaret H. Alston, W. H. Evans, T. D. N. Morgan, R. W. Newport, P. R. Williams, and A. Kirk (Univ. of Liverpool). Phil. Mag. (8) 2, 1143-6(1957) Sept.

Some 3734 $\pi^+ - \mu^+ - e^+$ decays have been observed in a propane bubble chamber, and the angular distribution of the positrons found to be $(dN/d\Omega) \propto 1 - (0.16 \pm 0.04) \cos\theta$. The decay and absorption of μ^- mesons in propane have also been investigated. (auth)

12825

TRANSITION AMPLITUDES FOR PHOTOPRODUCTION OF MESONS FROM NUCLEONS AND PHOTODISINTEGRATION OF THE DEUTERON. L. Donald Pearlstein and Abraham Klein (Univ. of Pennsylvania, Philadelphia). Phys. Rev. 107, 836-42(1957) Aug. 1.

An elementary technique of general applicability is applied to the explicit construction as operators in the spin space of the particles involved, of the transition matrices for photoproduction of mesons from nucleons and photodisintegration of the deuteron. (auth)

12826

INTERACTIONS OF LOW-ENERGY NEGATIVE PIONS WITH NUCLEI. Nina Byers (Univ. of Chicago, Ill.). Phys. Rev. 107, 843-9(1957) Aug. 1.

A boundary condition method is used to correlate the level shifts in π-mesonic atoms with the scattering of slow pions by light nuclei; carbon is chosen as an example. Up to 5-Mev kinetic energy, the s-phase shifts are dominant and a calculation of the scattering cross section is possible without much ambiguity. In the absence of sufficient experimental data on the p-level shifts, a best estimate is attempted in order to include p-wave scattering and to extend the predictions up to 10-Mev kinetic energy. (auth)

12827

Mu DECAY WITH NONCONSERVATION OF PARITY. Sigurd Larsen, Elihu Lubkin, and Menasha Tausner (Columbia Univ., New York). Phys. Rev. 107, 856-8(1957) Aug. 1.

The distribution of the decay electrons from polarized μ mesons is calculated, without presumption of parity conservation, time-reversal invariance, or charge-conjugation invariance. The four-component neutrino theory is used. The result is expressed in terms of three parameters, ρ, α, and ζ, of which ρ is the usual Michel parameter. Theoretical inequalities among these parameters are given. An analysis of experimental data is made in terms of these parameters, and the results are found to be in fair agreement with the more stringent requirements of two-component neutrino theory. (auth)

12828

CHARGE INDEPENDENCE AND HYPERON PRODUCTION. John L. Brown, Donald A. Glaser, Donald I. Meyer, Martin L. Perl, and John Vander Velde (Univ. of Michigan, Ann Arbor) and James W. Cronin (Brookhaven National Lab., Upton, N. Y.) Phys. Rev. 107, 906-8(1957) Aug. 1.

Total cross sections for productions of Λ^0, Σ^-, Σ^0, and Σ^+ hyperons by interactions of charged pions with hydrogen were measured, and it is concluded that production of Σ hyperons by fast pions striking protons is not a charge-independent process. (L.T.W.)

12829

IDENTITY AND PARITY OF K MESONS AND THE PARITY OF HYPERONS FROM A STRONG REACTION. Jack Sandweiss and Saul Barshay (Univ. of California, Berkeley). Phys. Rev. 107, 913(1957) Aug. 1.

The strong reactions $K^+ + p \rightarrow K^+ + K^+ + \Sigma^0$, $K^+ + p \rightarrow K^+ + K^+ + \Sigma^0$, and $K^+ + p \rightarrow K^+ + K^0 + \Sigma^+$ are considered, and the identity and parity of K mesons and the parity of hyperons from the reaction are discussed. (L.T.W.)

12830

INTERACTION OF π^--MESONS WITH LEAD, COPPER, OXYGEN AND BERYLLIUM NUCLEI. A. E. Ignatenko, A. I. Mukhin, E. B. Ozerov, and B. M. Pontecorvo (Academy of Sciences, USSR). Soviet Phys. JETP 4, 351-5(1957) Apr.

Measurements were made of the total cross sections σ_t for interaction of π^- mesons with Be, C, and O nuclei and of cross sections σ_{in} for inelastic collisions of π^- mesons with Be, C, Cu, and Pb in the energy range from 140 to 400 Mev. Cross sections were determined by measuring the attenuation of a meson beam which passed through the scatterer, using scintillation counters. The energy dependence of the cross sections σ_t and σ_{in} for nuclei in general shape resemble the energy dependence of the total scattering cross sections of pions on hydrogen and deuterium. Results of the cross section measurements were analyzed on the basis of the optical model. It can be concluded, as a result of this analysis, that the optical model with parameters computed on the basis of the single Coulomb interaction of the mesons with the nuclei satisfactorily describes the energy dependence of the cross sections in the energy range of 140 to 400 Mev. (auth)

12831
SCATTERING OF π^+-MESONS BY HYDROGEN. II. DISCUSSION AND INTERPRETATION OF THE RESULTS. A. I. Mukhin and B. M. Pontecorvo (Academy of Sciences, USSR). Soviet Phys. JETP 4, 373-81(1957) Apr.

A phase analysis is made of the data obtained on scattering by hydrogen of π^+ mesons of different energies up to 307 Mev. The analysis was carried out, using a high-speed electronic computer, on the assumption that the scattering process can be sufficiently accurately described by S- and P-waves [(S-P)-analysis], as well as on the assumption that the scattering process must be described by five parameters [(S-P-D)-analysis]. The energy dependence of the various phase shifts obtained for the (S-P)- and (S-P-D)-analyses are shown. It follows from the measurements that the radius of meson-nucleon interaction is about 7×10^{-14} cm. (auth)

12832
PRODUCTION OF POSITIVE π-MESONS IN HYDROGEN BY 660 Mev PROTONS. A. G. Meshkovskii, Iu. S. Pligin, Ia. Ia. Shalamov, and V. A. Shebanov. Soviet Phys. JETP 4, 404-8(1957) Apr.

With observation angles of 29° and 46° relative to a proton beam there were obtained energy spectra for the production of charged π mesons in the process $p + p \rightarrow \pi^+$. Differential cross sections were measured for the angles of 29°, 46°, and 65° in the laboratory system. (auth)

12833
ON THE ABSORPTION OF K^--MESONS BY HELIUM NUCLEI. S. G. Matinian (Academy of Sciences, Georgian SSR). Soviet Phys. JETP 4, 431(1957) Apr.

12834
ON $K_{\mu 3}$-DECAY. S. G. Matinian (Academy of Science, Georgian SSR). Soviet Phys. JETP 4, 434-6(1957) Apr.

Calculations are given for the energy spectrum of the μ mesons and π^0 mesons in the $K_{\mu 3}$ decay, and the decay constant is estimated. (R.V.J.)

12835
MEASUREMENT OF THE LIFETIMES OF K-MESONS. M. Ia. Balats, P. I. Lebedev, and Iu. V. Obukhov. Soviet Phys. JETP 4, 436-7(1957) Apr.

The integral spectrum of K-meson decay times in the interval of 10^{-8} to 4×10^{-8} sec estimated for 64 cases and a single exponent decay yielded a mean lifetime of K mesons of $(9.5 \pm 2.0) \times 10^{-9}$ sec. (R.V.J.)

12836
DETERMINATION OF THE SPINS OF K-PARTICLES AND HYPERONS. L. I. Lapidus (Academy of Sciences, USSR). Soviet Phys. JETP 4, 447-8(1957) Apr.

12837
A THEOREM ON THE EQUALITY OF THE CROSS SECTIONS FOR PHOTOPRODUCTION OF CHARGED π-MESONS ON NUCLEI WITH ISOTOPIC SPIN ZERO. V. L. Pokrovskii (West Siberian Branch of the Academy of Sciences, USSR). Soviet Phys. JETP 4, 459-60(1957) Apr.

METEOROLOGY

12838 HW-47721 A
General Electric Co. Hanford Atomic Products Operation, Richland, Wash.
METEOROLOGY AS RELATED TO WASTE DISPOSAL AND WEAPONS TESTS. J. J. Fuquay. Jan. 15, 1957. 39p. Contract W-31-109-Eng-52. $0.30(OTS).

This report supersedes HW-47721.

Meteorological factors affecting the atmospheric dispersal of radioactive particles, whether from stack effluent or fall-out following weapons tests, are discussed. A method is presented for computing fall-out from surface bursts. 16 references. (C.H.)

12839 KAPL-M-BFK-1
Knolls Atomic Power Lab., Schenectady, N. Y.
KNOLLS AND WEST MILTON SITE METEOROLOGY PROGRAM REVIEW. B. F. Knapp. July 1, 1957. 19p. Contract [W-31-109-Eng-52]. $4.80(ph OTS); $2.70(mf OTS).

The meteorology programs at the West Milton and Knolls Sites are reviewed. (C.H.)

NEUTRONS

12840 NACA-1283
Lewis Flight Propulsion Lab., Cleveland, Ohio.
EXTRAPOLATION TECHNIQUES APPLIED TO MATRIX METHODS IN NEUTRON DIFFUSION PROBLEMS. Robert R. McCready. May 12, 1955. 12p.

This report supersedes NACA-TN-3511.

An iterative scheme is developed for the matrix solution of the type of characteristic-value problem arising from homogeneous linear equations. The scheme is shown to minimize a suitable form at each step. Extrapolation techniques for speeding convergence are developed and refined. An example from nuclear-reactor theory is presented. (NACA)

12841
LIMITING CONDITION OF NEUTRON DIFFUSION AT THE RIM OF AIR HOLES. Dietrich Bünemann. Atomkern Energie 2, 201-3(1957) June. (In German)

In spite of the failure of the diffusion theory in a vacuum, especially in air holes with a first approach to the transport theory, suitable transition requirements for diffusion theory can be preserved. (tr-auth)

12842
AN INVESTIGATION OF THE ELASTIC SCATTERING OF 590 Mev NEUTRONS BY NEUTRONS. B. M. Golovin and V. P. Dzhelepov (Academy of Sciences, USSR). Soviet Phys. JETP 4, 303-9(1957) Apr.

The differential scattering cross section for the elastic scattering of neutrons by neutrons has been determined using a neutron telescope. The effective energy of the neutrons was 590 Mev. A striking anisotropy of the (n−n) scattering has been established: $\sigma_{nn}(30°)/\sigma_{nn}(90°) = 2.3$. It has been found that the differential (n−n) scattering cross section in the investigated angular region $(30° \leq \vartheta \leq 90°)$ is equal to the proton-proton cross section at the same energy within experimental error. This fact definitely points to the charge symmetry of nuclear forces at high energy. (auth)

NUCLEAR PHYSICS

12843 NP-6427
Pittsburgh. Univ. Sarah Mellon Scaife Radiation Lab.
THE DETERMINATION AND INTERPRETATION OF NUCLEAR RADII BY NEUTRON SHAPE ELASTIC SCATTERING (thesis). Technical Report No. VIII On PRECISION SCATTERING OF NUCLEAR PARTICLES. Kamal Kishore Seth. Aug. 1957. 158p. Project NR022-068. Contract N7onr-32505.

The nuclear radius concept is discussed, and brief descriptions of the nuclear models developed to describe particle capture and scattering are given. The optical model, with modifications, is shown to be in reasonable agreement with extensive resonance data on a number of nuclei. The BNL fast chopper, as modified for the experimental measurements, is described. (D.E.B.)

12844

FUNDAMENTAL CONCEPTS OF NUCLEAR PHYSICS. VIII. EXCITED STATE OF THE NUCLEUS. Werner Braunbek. Atomkern Energie 2, 190-2(1957) May. (In German)

12845

INVARIANCE PROPERTIES OF FERMI INTERACTIONS. D. L. Pursey (Univ. of Edinburgh, Scotland). Nuovo cimento (10) 6, 266-77(1957) Aug.

The effect of vanishing observable neutrino mass on the conditions that Fermi interactions should be invariant under P, T, and C is investigated. A minor correction is given to the formula for β—ν angular correlation given by Lee and Yang. Results are obtained which reduce the labor of extending existing calculations to interactions which are not invariant under P, T, or C. Some obscurities in the existing literature on β-spectrum shape correction factors are clarified. It is shown that in μ-meson decay, to lowest order, there can be no interferences between the group of interactions (V, A) and the group (S, T, P). An alternative to Salam's neutrino gage hypothesis is indicated. The foundations of the method used in the paper are discussed. A general theorem on weak interactions which are invariant under P but not under T or C, together with two corollaries, is stated in an appendix, and the proof is outlined. (auth)

12846

INDIVIDUAL MASS REVERSAL AND PARITY NON-CONSERVATION. S. Hori and A. Wakasa (Univ. of Kanazawa, Japan). Nuovo cimento (10) 6, 304-10(1957) Aug.

Some consequences of the assumption that every interaction which exists in nature never allows the determination of the signs of masses of all elementary particles, are discussed. The assumption entails the postulate of invariance of all interactions under a set of transformations called individual mass reversal. The electromagnetic interaction and the π-N interaction, being parity-conserving, are compatible with the postulate, provided that the latter is a PS(PV)-coupling. Most Fermi interactions and interactions such as $\Lambda N\pi$ and ΛNK are not allowed, unless they do not conserve parity. Although some strong interactions are parity-non-conserving, no serious difficulty arises if a charge conjugate state is defined, since the theory is proved to be invariant under the product of charge conjugation and space inversion. This theory is equivalent to the two component neutrino theory of T. D. Lee and C. N. Yang for neutrino processes, except the μ-e decay. (auth)

12847

ON THE QUESTION OF POSSIBLE CHARGE PROPERTIES OF WEAK INTERACTIONS. R. Gatto and R. D. Tripp (Univ. of California, Berkeley). Nuovo cimento (10) 6, 367-70(1957) Aug.

12848

A SYSTEMATIZATION OF WEAK INTERACTIONS. N. Nakanishi (Kyoto Univ., Japan). Nuovo cimento (10) 6, 383-4(1957) Aug.

In Lee and Yang's two-component neutrino theory, there exist only "right-handed screw" neutrinos in our world. Since the "left-handed screw" neutrinos should have the same right to exist from reasons of symmetry, the other (fantastic) world is supposed where only left-handed neutrinos would exist. The transformation from this world to the other one is considered and conclusions are drawn. (M.H.R.)

12849

PROBABILITIES OF SYMMETRIC AND ASYMMETRIC FISSION IN THE PROTON BOMBARDMENT OF Th^{232}. B. J. Bowles, F. Brown, and J. P. Butler (Atomic Energy Research Establishment, Harwell, Eng.). Phys. Rev. 107, 751-6(1957) Aug. 1.

The ratio of symmetric to asymmetric fission in the proton bombardment of Th^{232} does not rise steadily with increasing proton energy; a periodic decrease is superposed upon the over-all increase. This is attributed to the changing pattern of various fission reactions, (p,f), (p,nf), etc. (auth)

12850

KINEMATICS OF β DECAY AND PARITY NONCONSERVATION IN WEAK INTERACTIONS. Bernard T. Feld (Massachusetts Inst. of Tech., Cambridge). Phys. Rev. 107, 797-804(1957) Aug. 1.

A general description of a Dirac spinor is given in terms of two-component spin wave functions corresponding to its large and small components. These may be used to describe the final states resulting from a β-decay interaction in a form which permits the derivation of angular distributions and correlations by utilization of the quantum-mechanical combination properties of angular momenta. The two-component eigenvectors are such that the one corresponding to the small component of the Dirac spinor has opposite parity from the large component. Hence, this representation is naturally extended to the description of interactions in which parity is not conserved. A general formulation is given for the final-state wave functions corresponding to such interactions, and is used to discuss the β decay of unpolarized and polarized nuclei, pions, muons, and heavy mesons. Appropriate choice of the parameters in this description is shown to lead to the two-component neutrino theory of Lee and Yang, Landau, and Salam. Finally, a detailed discussion is given of the consequences of parity nonconservation in the π-meson decay modes of a heavy meson, with particular emphasis on the possibilities of its observation in the τ decay mode of a spin-1 heavy meson. (auth)

12851

ONE-DIMENSIONAL NUCLEON-NUCLEAR WALL MODEL. David M. Chase (Los Alamos Scientific Lab., N. Mex.). Phys. Rev. 107, 805-19(1957) Aug. 1.

A one-dimensional system of a particle interacting with a dynamic potential well is studied as a primitive analog, with regard to methods and results, for more realistic three-dimensional models. A δ-function approximation (linear in the deformation) to the interaction leads to an unnormalizable wave function and negatively infinite eigenenergies for levels of the ground-state nucleonic band when a certain parameter of the system exceeds unity. Results of numerical computations of eigenenergies by the following approximation methods are given and compared: (1) adiabatic Born-Oppenheimer, (2) static Rainwater, (3) no-recoil, single-exciton Tamm-Dancoff, (4) energy-shell, t_m-exciton Tamm-Dancoff. Of these, the first is based on the "true" interaction, the last three on the δ function. The no-recoil, unlike the energy-shell, procedure is capable of yielding a resonable approximation to eigenenergies of the true interaction for the ground-state band in spite of the divergence. Eigenenergies of a higher band computed by method (4) as functions of coupling strength and of t_m for $t_m \leq 4$ converge rapidly but are less depressed by the interaction than those computed by (1). Scattering of the particle by the well is similarly investigated by (1) distorted-wave Born, (2) adiabatic, and (3) energy-shell Tamm-Dancoff approximations. From numerical computations, resonances through quasi-bound intermediate states are found to dominate the energy dependence of cross sections except at very weak coupling, so that the Born and adiabatic approximations are unsatisfactory. The single-level Breit-Wigner formula is

shown to be unsuitable for describing these resonances when inelastic channels are open. The single-particle level structure of the potential well modulates the resonances, and single-particle antiresonances suppress the effect of intermediate states of lower particle energy, influencing convergence with respect to the number of wall excitons included, t_m. Qualitative inferences are made concerning three-dimensional models involving collective nuclear motion. (auth)

NUCLEAR PROPERTIES

12852 AERE-T/R-2210

Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.

THE WIDTHS AND SPACINGS OF RESONANCE LEVELS: A REVIEW OF THE METHODS FOR THE EXPERIMENTAL DETERMINATION OF THEIR STATISTICAL PROPERTIES. A. M. Lane and J. E. Lynn. Mar. 1957. 41p.

Until recently the standard method for obtaining information about the statistical properties of the widths and spacings of resonance levels was the most direct method, i.e., the measurement of the widths and spacings of individual resonances and a subsequent statistical analysis of the measured values. Although this method is evidently the most straightforward one in principle, it suffers, in practice, some severe limitations due mainly to the lack of resolving power of present apparatus. Consequently one tries to devise other methods that may not be subject to this trouble. In other words, one measures cross sections without any special effort to resolve resonances and then tries to extract information from the resulting smoothed curves. Both the standard methods of resonance analysis and some new methods for extracting information from cross sections measured with poor resolution are reviewed. (auth)

12853 ASAE-23

American Radiator and Standard Sanitary Corp. Atomic Energy Div., Redwood City, Calif.

ENERGY DEPENDENCE OF PARAMETERS FOR A CROSS-SECTION LIBRARY. Irvin W. Richardson. Aug. 1957. 23p.

The tedious task of providing the constants for large multigroup problems has been greatly alleviated by American-Standard's Sigma computer program which averages an extensive library of cross sections. The library data, the sources of that data, and the format in which the data are presented are discussed; in particular, the high energy phenomena of inelastic scattering, anisotropic elastic scattering, and the decrease in the average logarithmic decrement with increasing incident energy are analyzed. (auth)

12854 IDO-16391

Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.

RELATIVE NEUTRON LIFETIMES IN THE MTR FUELED WITH U^{235} AND Pu^{239}. H. L. McMurry and B. W. Johnson. Aug. 8, 1957. 15p. Contract AT(10-1)-205. $0.50(OTS).

Neutron lifetimes of 81 and 68 microseconds are calculated for the MTR fueled with U^{235} and Pu^{239}, respectively, using the Nordheim equation. The model employed probably underestimates the lifetimes, but the ratio of 68/81 = 0.84 for the Pu^{239} to U^{235} lifetime should be significant. (auth)

12855 UCRL-3879

California. Univ., Berkeley. Radiation Lab.

DECAY STUDIES OF SOME NEUTRON-DEFICIENT ISOTOPES OF ANTIMONY AND TELLURIUM (thesis). Ann Rhodes. Aug. 1957. 23p. Contract W-7405-eng-48. $4.80(ph OTS); $2.70(mf OTS).

Helium-ion bombardments of In, and He-ion, deuteron, and proton bombardments of Sn in the Berkeley 60-inch cyclotron led to the discovery of some new Sb and Te activities. Four new half lives were observed in the neutron-deficient Sb region. These are 4.0 ± 0.3 hr, 60 ± 10 min, 30 ± 5 min, and 7 ± 2 min. New half lives discovered for light Te isotopes are 7.5 ± 1.5, 1.4 ± 0.2 hr, and 16 ± 2 min. Energies of some gamma radiation associated with these activities were measured. Discussion of their possible identities is included, but in view of the similarity of half lives and prevalence of isomerism in the region, no definite mass assignments could be made. (auth)

12856

A REVISED SEMIEMPIRICAL ATOMIC MASS FORMULA. A. G. W. Cameron (Atomic Energy of Canada, Ltd., Chalk River, Ontario). Can. J. Phys. 35, 1021-32(1957) Sept.

A new mass formula has been constructed which contains volume and surface energies, each with a symmetry energy contribution, Coulomb and Coulomb exchange energies, and shell correction and pairing energies. A nuclear model with a trapezoidal radial-density distribution was used. The central density was assumed constant, and the dimensions were adjusted to fit the Stanford electron-scattering results. The symmetry energy coefficients were determined by a least-squares fit to the valley of beta stability. The volume and surface energy coefficients were determined by a least-squares fit to 89 odd-odd masses uniformly spaced in mass number. The shell correction and pairing energies were assumed to be independent functions of the proton and neutron numbers; they were empirically determined from the differences between masses computed from the formula without corrections and those tabulated by Wapstra and Huizenga. The median energy difference between the corrected formula and the Wapstra-Huizenga masses is about 300 kev. Some remarks are made concerning the implication of these results for nuclear deformations and fission thresholds. (auth)

12857

THE LOW LEVELS OF Si^{29}. D. A. Bromley, H. E. Gove, E. B. Paul, A. E. Litherland, and E. Almqvist (Atomic Energy of Canada Ltd., Chalk River, Ontario). Can. J. Phys. 35, 1042-56(1957) Sept.

Information on the low levels in Si^{29} has been obtained by studying the gamma radiation associated with the $Si^{29}(p, p'\gamma')Si^{29}$ inelastic-scattering reaction in the proton-energy range from 2.5 to 3.0 Mev and with the $Al^{29}(\beta^-)Si^{29}$ negatron decay. Angular-distribution measurements have shown that the 2.03 Mev level in Si^{29} has spin 5/2, and are consistent with a 3/2 assignment to the 1.28 Mev level. The E2/M1 E2 branching ratio for the de-excitation of the 2.03 Mev state has been measured to be approximately 100. Log ft values of < 5.2, > 6.5, and 5.2 have been determined for the branches of the Al^{29} decay to the 2.43, 2.03, and 1.28 Mev states in Si^{29}. (auth)

12858

APPLICATION OF A COLLECTIVE MODEL TO Si^{29}. D. A. Bromley, H. E. Gove, and A. E. Litherland (Atomic Energy of Canada, Ltd., Chalk River, Ontario). Can. J. Phys. 35, 1057-85(1957) Sept.

A strong-coupling collective model has been applied to a description of the low levels of Si^{29}. Detailed comparisons of the predictions of this model with static and dynamic properties of the low levels of the A = 29 isobaric system have been made; experimental data on the level spectrum,

ground-state magnetic moment, decoupling parameter, reduced widths for nucleon capture in deuteron-induced stripping reactions, as well as gamma- and beta-ray transition widths have been used in the comparisons. These indicate that Si^{29} has an oblate shape with a spheroidicity parameter $\delta \simeq -0.15$. Although agreement between experiment and theory is in some cases only qualitative, it is shown that current collective models have relevance for the description of nuclear properties in this mass range. (auth)

12859

THE EFFECT OF INTERACTIONS ON THE ANGULAR DISTRIBUTION OF γ-RAYS FROM AN ASSEMBLY OF ORIENTED NUCLEI. J. M. Daniels (Univ. of British Columbia, Vancouver). Can. J. Phys. 35, 1133-45(1957) Sept.

The angular distribution of γ radiation from an assembly of nuclei oriented by the magnetic h.f.s. method can be very much modified by interactions between the radioactive ions and other paramagnetic ions in the crystal. In order to calculate the effect of these interactions, an operator Γ is derived which represents the angular distribution at any temperature is given by $\mathrm{Spur}(\Gamma\rho)$, where ρ is the statistical matrix $\exp(-\mathcal{H}/kT)/\mathrm{Spur}[\exp(-\mathcal{H}/kT)]$, $\mathcal{H}$ being the Hamiltonian for the whole crystal. For a high temperature approximation, ρ is expanded in powers of $1/T$. It is found that, for alignment by the magnetic h.f.s. method, the first term which contains interaction parameters is that in $1/T^4$, and an expression is given for the contribution of interactions to this term. At very low temperatures, perturbation theory is used to estimate the effect of interactions on the lowest nuclear energy state, and hence on the angular distribution of γ rays. It is found that, if an external magnetic field is applied along a principal axis of the g-tensor of the radioactive ions, interactions have no influence on the angular distribution of γ rays in the limit of large fields. It is also shown that Bleaney's restriction, that for a successful nuclear orientation experiment the broadening of the levels should be less than the hyperfine splitting, is not necessary in this case. (auth)

12860

GAS PHASE REACTIONS ACTIVATED BY NUCLEAR PROCESSES. Adon A. Gordus and John E. Willard (Univ. of Wisconsin, Madison). J. Am. Chem. Soc. 79, 4609-16 (1957) Sept. 5.

It is known from previous work that I^{128} and Cl^{38} activated by radiative neutron capture are able to replace hydrogen in organic compounds by unique processes. The work of the present paper shows that: (1) Br^{80} can undergo similar reactions, following either radiative neutron capture or isomeric transition: (2) all three halogen species can replace hydrocarbon radicals as well as hydrogen atoms; (3) several modes of replacement are possible for reaction of a single type of halogen with a single type of target molecule—at least nine different organic iodides being formed by reaction of I^{128} with n-butane; (4) the nature of the compound in which the halogen is contained prior to neutron capture has little or no effect on the reactivity of the activated atom, but the nature of the parent compound seems to affect this reactivity when activation is by isomeric transition; (5) tritium produced by the $He^3(n,p)H^3$ process in gaseous hydrocarbons enters organic combination by a process which is apparently similar to the halogen reactions noted. It is suggested that these reactions are of the ion-molecule type. The demonstration that such reactions occur in the gas phase makes it probable that they contribute to organic yields in the more extensively studied condensed phases, where it is impossible to distinguish them experimentally from radical combination reactions. The application of gas phase chromatography to the analysis of mixtures of tracer amounts of radioactive materials is illustrated in this paper. (auth)

12861

DIFFERENCE IN THE BEHAVIOUR OF THE ^{81}Se ISOMERS FOLLOWING NEUTRON CAPTURE. D. J. Apers, P. C. Capron, and L. J. Gilly. J. Inorg. and Nuclear Chem. 5, 23-30(1957).

Experiments on neutron-irradiated selenium oxide in the solid state as well as in aqueous solution indicate a different chemical behavior of the two selenium isomers, as a function of the physical state and of the neutron energy. The difference is shown in the activity ratios of the two isomers in the filtrate and the residue when passed through a sintered porcelain disc. These activity ratios are more significant than the absolute values of the retentions. If impurities have any effect it can only be to strengthen the hypothesis of the difference in chemical behavior. A determination of the periods of the two isomers gives 18.6 ± 0.1 min and 62.0 ± 1.0 min. (auth)

12862

THE ORBITAL ELECTRON CAPTURE DECAY OF ^{185}Os. A. Bisi, E. Germagnoli, and L. Zappa (Lab. CISE, Milano). Nuovo cimento (10) 6, 299-303(1957) Aug.

Radiations emitted in the orbital electron capture decay of Os^{185} have been investigated by means of a scintillation spectrometer and with the help of coincidence methods. The total decay energy was found to be 984 kev: the orbital electron capture decay is complex and one of the transitions involved shows an anomalous L/K-capture ratio. It is suggested that this transition can be classified as second forbidden ($\Delta I = 2$; yes). (auth)

12863

COMPARISON BETWEEN THE PROTON ENERGY SPECTRA OF (n,p) AND (d,p) REACTIONS. J. Blok and C. C. Jonker. Nuovo cimento (10) 6, 378-9(1957) Aug.

Reactions with the same product nucleus were compared, $Mg^{24}(n,p)Na^{24}$ with $Na^{23}(d,p)Na^{24}$ and $Si^{28}(n,p)Al^{28}$ with $Al^{27}(d,p)Al^{28}$ to find out if relative maxima in the (n,p) spectra correspond with giant resonances in the (d,p) spectra. It is concluded that the deviations in the proton energy spectra of (n,p) reactions have the same origin as the giant resonances in the (d,p) spectra, although there is a large difference in reaction mechanism e.g. in the contribution by compound nucleus formation. (M.H.R.)

12864

A NOTE CONCERNING THE ELECTRIC HEXADECAPOLE MOMENT OF THE FIRST EXCITED ^{111}Cd NUCLEUS. H. Narumi and S. Matsuo (Kyoto Univ., Japan). Nuovo cimento (10) 6, 398-9(1957) Aug.

It is concluded that the Zurich angular correlation experiment did not find the effect of the electric hexadecapole moment of the first excited state of the Cd^{111} nucleus, but could be interpreted by the electric quadrupole interaction induced by lattice phonons. It will be possible to expect an extranuclear effect of the pure hexadecapole moment in question, when the experiment is performed with high accuracy at low temperature. (M.H.R.)

12865

NUCLEAR ALIGNMENT OF YTTERBIUM 175. M. A. Grace, C. E. Johnson, R. G. Scurlock, and R. T Taylor (Clarendon Lab., Oxford). Phil Mag. (8) 2, 1079-84(1957) Sept.

Nuclear alignment of Yb^{175} has been obtained by cooling a single crystal of ytterbium ethyl sulfate to about 0.014°K and was detected by observing the anisotropic angular distributions of the two most energetic γ rays. A relationship

between the mixing ratios δ(M2/E1) for these γ rays is obtained. $\gamma-\gamma$ angular correlation measurements for the 282 and the 114 kev γ rays show sensibly the same value for the correlation coefficient A_2 of + 0.205 ± 0.015 for solid and liquid sources containing Yb^{175}. By use of $|\delta|$ = 0.17 ± 0.03 for the 282 kev γ-ray determined from the angular correlation measurements, the mixing ratio for the 396 kev γ ray is found to be + 0.10 ± 0.03. The nuclear moment of Yb^{175} is 0.15 ± 0.04. (auth)

12866

THE 4.77 Mev LEVEL IN BORON 10. H. Warhanek (Cavendish Lab., Cambridge, Eng.). Phil. Mag. (8) 2, 1085-8(1957) Sept.

The angular distribution of the γ rays in $Li^6(\alpha\gamma)B^{10}$ has been measured for the 500 kev resonance. Spin and parity of the 4.77 Mev level in B^{10} are 2+ or 3+. The intensity of the direct transition to the ground state is less than 3% of the intensity of the 4.05 Mev γ transition. The width of the level $\omega\Gamma_\alpha\Gamma_\gamma/\Gamma_\alpha + \Gamma_\gamma$ is about 5×10^{-2} ev. The 4.05 Mev E2 transition is at least twice as strong as one would expect from the Weisskopf formula. (auth)

12867

HYPERFINE-STRUCTURE SEPARATIONS AND MAGNETIC MOMENTS OF Rb^{81}, Rb^{82}, Rb^{83}, AND Rb^{84}. J. C. Hubbs, W. A. Nierenberg, H. A. Shugart, H. B. Silsbee, and R. J. Sunderland (Univ. of California, Berkeley). Phys. Rev. 107, 723-7(1957) Aug. 1.

Measured by an atomic-beam magnetic resonance method, the hyperfine-structure separations and magnetic moments of four neutron-deficient isotopes are found to be: Rb^{81}, $\Delta\nu$ = 5097 ± 13 Mc/sec, μ_I = + 2.05 ± 0.02 nm; Rb^{82}, $\Delta\nu$ = 3094.1 ± 2.4 Mc/sec, μ_I = + 1.50 ± 0.2 nm; Rb^{83}, $\Delta\nu$ = 3183.3 ± 5.8 Mc/sec, μ_I = + 1.42 ± 0.02 nm; and Rb^{84}, $\Delta\nu$ = 3077.5 ± 5.1 Mc/sec, μ_I = −1.32 ± 0.02 nm. (auth)

12868

PRECISION DETERMINATION OF THE LOW-LYING ENERGY LEVELS OF W^{182}, W^{183}, W^{184}, AND W^{186}. E. L. Chupp, A. F. Clark, J. W. M. DuMond, F. J. Gordon, and Hans Mark (Univ. of California, Livermore). Phys. Rev. 107, 745-50(1957) Aug. 1.

The low-lying energy levels in the tungsten isotopes have been studied by using the 3.7-Mev proton beam of the A-48 high-current linear accelerator at the University of California Radiation Laboratory, Livermore, to excite the nuclei. The large beam currents available make it possible to use a bent-quartz-crystal spectrograph to observe the resultant γ rays. With such an instrument, a resolution of better than 0.1% is possible. The following γ rays have been observed: W^{182}, 100.07 ± 0.05 kev; W^{183}, 46.508 ± 0.030 kev and 52.612 ± 0.030 kev; W^{184}, 111.13 ± 0.06 kev; W^{186}, 122.48 ± 0.08 kev. (Energies relative to W K-series x rays.) The isotopic assignments are known from previous work on these lines. Known wavelengths of the K-series x rays of tungsten and certain nuclear lines were used to calibrate the plate. (auth)

NUCLEAR REACTORS

12869 AECU-3539

New York Univ., New York. Coll. of Engineering.

PHOTOELASTIC ANALYSIS OF A PRESSURE VESSEL CLOSURE. Final Report. Technical Report SM-56-17. Dec. 1956. 38p. Sponsored by Foster Wheeler Corp. for Westinghouse Electric Corp., [Bettis Plant]. Contract AT-11-1-GEN-14, Subcontract No. 73-(14-438). $6.30 (ph OTS); $3.00(mf OTS).

A photoelastic stress analysis was performed on the removable closure of a pressure vessel. The highest stress was found to occur at the outer radius of the knuckle where the shell joins the flange. This stress, which is tensile, acts meridionally on the knuckle. In terms of the loading pressure, σ/p = 12.5 at this location. The ratio of bolt load to pressure force was 1.50. The effective diameter of the circle of bearing reaction between the model and backup heads was found, from fringe photographs, to be 13.125 in. The work of the project involved the tooling for, and fabrication of, the model and backup heads, construction of the heating and loading equipment, loading of the model and freezing of the stresses, slicing of the model, and analysis and interpretation of the fringe patterns in the slices. (auth)

12870 AECU-3555

Massachusetts Inst. of Tech., Oak Ridge, Tenn. Engineering Practice School.

FREQUENCY RESPONSE ANALYSIS OF HRT MOCKUP PRESSURIZER-LEVEL CONTROL LOOP. Ralph Gelman and Charles S. Robertson, Jr. Oct. 19, 1956. 32p. For Union Carbide Nuclear Co. Contract [W-7405-eng-26; Subcontract 70]. (KT-240). $6.30(ph OTS); $3.00(mf OTS).

The HRT Mockup is a complete working model of the HRT designed to test various reactor components and controls under anticipated operating conditions with nonradioactive solution. The stability and response characteristics of the HRT Mockup Pressurizer-Level Control Loop as well as the effectiveness of pneumatic damping units have been investigated and are presented. (auth)

12871 AERE-R/R-2191(Rev.)

Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.

TWO GROUP PERTURBATION STUDIES OF A REFLECTED LIQUID METAL FUEL REACTOR. J. J. Thompson. July 1957. 22p. (LMFR/P-5).

Two group models of a bare and a reflected homogeneous graphite moderated spherical reactor were studied to analyze the effect of a reflector on neutron lifetimes and reactivity coefficients. The prompt and final temperature coefficients are of the same order, but perturbation theory leads to a positive moderator temperature coefficient in the reflected system. If the theory is modified to maintain continuity of neutron flux at the core reflector interface, all core coefficients are negative. A cylindrical pipe of fuel solution through the reflector would reduce the fuel concentration calculated for a completely reflected system by more than 10%. (auth)

12872 AI-1612

Southern California Edison Co., Los Angeles and Atomics International Div., North American Aviation, Inc., Canoga Park, Calif.

A REPORT ON THE INTERACTION OF THE NUCLEAR AND POWER PLANT CONTROLS FOR THE SRE STEAM ELECTRIC GENERATING STATION. Apr. 30, 1956. 24p.

The control system that interconnects the SRE with the steam plant is described in detail. The operation of the control systems under both normal and abnormal operating conditions is considered. (W.L.H.)

12873 ANL-5629

Argonne National Lab., Lemont, Ill.

MANUFACTURE OF FUEL PLATES FOR THE EXPERIMENTAL BOILING WATER REACTOR. R. E. Macherey, C. H. Bean, N. J. Carson, Jr., and J. R. Lindgren. June 1957. 250p. Contract W-31-109-eng-38. $6.00(OTS).

The Experimental Boiling Water Reactor (EBWR), constructed on the site of the Argonne National Laboratory (ANL), is currently fueled with an uranium alloy containing 5 wt. % Zr and 1.5 wt. % Nb. The fuel is in the form of

plates integrally clad with Zircaloy-2 by roll bonding and is divided into two isotopic concentrations, natural uranium and uranium enriched to the extent of 1.44% U^{235}. The plates are in two thicknesses, 0.210" and 0.273", with the width and length of all plates being 3-5/8" and 54", respectively. The manufacturing practice used in the production of approximately 1100 plates, of which 888 were required to completely load the reactor, is described. Discussed in the paper are the production of the uranium fuel alloy, the fabrication of the cladding components from Zircaloy-2 ingot, the assembly, welding, evacuation, and sealing of the cladding billets, the jacketing of the cladding billets with steel, and the roll bonding, heat treatment, stripping, and cleaning of the fuel plates. Evaluation of the fuel plates produced is also included. (auth)

12874 APEX-331

General Electric Co. Aircraft Nuclear Propulsion Dept., Cincinnati.

OFF CENTER CONTROL ROD ANALYTIC TWO ENERGY GROUP METHOD. John T. White. Aug. 10, 1956. 18p. (DC-56-9-23).

The two-energy-group analysis of a cylindrical reactor with an eccentric control rod is formulated for numerical evaluation on a digital computer. The control rod can be represented by arbitrary fast and slow albedos at its surface. (auth)

12875 BAW-1009

Babcock and Wilcox Co. Atomic Energy Div., Lynchburg, Va.

LIQUID METAL FUEL REACTOR EXPERIMENT TEST PROGRAM REPORT. Apr. 1957. 37p. Contract AT(30-1)-1940. $0.30(OTS).

The test program consists of tests and operations to be performed prior to startup, during startup and low-power operation, the approach to full power, a one-year full-power demonstration, and supplemental experiments to follow the power demonstration. (D.E.B.)

12876 BNL-3342

Brookhaven National Lab., Upton, N. Y.

TRANSIENT PRESSURES IN NUCLEAR REACTORS. J. A. Fleck, Jr. Aug. 1956. 20p. $3.30(ph OTS); $2.40 (mf OTS).

A rigorous examination is made of the transient pressure in an untapered reactor core containing a frictionless compressible coolant. It is found that the maximum pressure is determined primarily by the length of time required for an acoustic signal to travel from the reactor core boundaries to the core center. For a linearly rising temperature it is determined that the maximum transient pressure is quite independent of the amount of fluid in the pipes leading to and from the core. This result disagrees significantly with those obtained on the assumption of an incompressible fluid external to the core. Calculations for a liquid bismuth coolant indicate that excessive transient pressures are unlikely. (auth)

12877 CF-57-6-100

Oak Ridge National Lab., Tenn.

THE RELATIONSHIP OF AQUEOUS ThO_2 SLURRY PHYSICAL PROPERTIES TO THE ENGINEERING DESIGN OF A REACTOR SYSTEM. D. G. Thomas. June 17, 1957. 22p. Contract [W-7405-eng-26]. $4.80(ph OTS); $2.70(mf OTS).

In a reactor system the principal components affected by slurry properties are the blanket vessel, pressurizer, heat exchanger, and dump tank. The particular properties that affect the operation of these components are: caking, degree of flocculation, foaming, and slime formation. These properties are related to the characteristics of components in a reactor system through experience gained in the operation of slurry loops. It is pointed out that the optimum slurry for one component may not necessarily be the optimum for another. (auth)

12878 CF-57-7-21

Oak Ridge National Lab., Tenn.

EFFECT OF CORE CORROSION SAMPLE ASSEMBLY ON HRT CRITICAL CONCENTRATION. Paul N. Haubenreich. July 18, 1957. 10p. Contract [W-7405-eng-26]. $3.30 (ph OTS); $2.40(mf OTS).

The critical concentrations of U^{235} in the HRT were plotted with and without the core corrosion sample assembly. At 280°C the assembly raises the critical concentration by 0.6 g U^{235} per kg D_2O. (D.E.B.)

12879 CF-57-7-108

Oak Ridge National Lab., Tenn.

INVESTIGATION OF EFFECTIVENESS OF HRT SYSTEM FOR VENTING GAS FROM BACK OF FUEL AND BLANKET CIRCULATING PUMPS. J. C. Moyers. July 29, 1957. 3p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

12880 CF-57-9-36

Oak Ridge National Lab., Tenn.

ALLOWABLE PRESSURE DIFFERENTIALS FOR HRT CORE VESSEL. R. D. Cheverton. Sept. 13, 1957. 7p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

Calculations are presented of the allowable pressure differentials for the HRT core vessel. (W.L.H.)

12881 CF-57-9-51

Oak Ridge National Lab., Tenn.

PRELIMINARY STUDY CONDENSING WATER REQUIREMENTS AND EFFECT OF WATER TEMPERATURE ON ELECTRICAL POWER OUTPUT HRE-3. Roy C. Robertson. Sept. 16, 1957. 3p. Contract W-7405-eng-26. $1.80 (ph OTS); $1.80(mf OTS).

12882 CRDC-647

Atomic Energy of Canada Ltd. Chalk River Project, Chalk River, Ont.

DEFECT TEST ON U-2 w/o Zr ALLOY IN THE X-2 LOOP; TEST NO. 2. R. F. S. Robertson. May 1957. 23p. (AECL-463).

Results are given of a test carried out in loop X-2 in the NRX reactor in which a specimen of U–2 wt. % Zr alloy sheathed in Zircaloy-2 was subjected to flowing water at 550°F in the reactor flux. The sample was defected with a 0.10" hole through the sheath to the U alloy beneath. (M.H.R.)

12883 DP-200

Du Pont de Nemours (E. I.) & Co. Savannah River Lab., Augusta, Ga.

XENON TABLES. Hugh K. Clark and Julius C. English. May 1957. 134p. Contract AT(07-2)-1. $3.50(OTS).

Tables are presented that may be used to estimate the reactivity transients resulting from Xe poisoning in any thermal reactor that employs U^{235} as the principal fissionable material. The Xe^{135} concentration is given as a function of time in units of Xe absorptions per fission neutron. For enriched reactors, these units approximate closely the reactivity held in Xe. The thermal flux is expressed in units of megawatts from thermal fissions per kg of U^{235}. Table entries are spaced at flux increments of 0.005, 0.01, and 0.02 in the flux ranges 0 to 1.0, 1.0 to 3.0, and 3.0 to 10.0, respectively. (auth)

12884 DP-222

Du Pont de Nemours (E. I.) & Co. Savannah River Lab., Augusta, Ga.

IBM 650 ROUTINE II; NEUTRON ENERGY SPECTRA IN

WATER. Julius C. English. July 1957. 44p. Contract AT(07-2)-1. $0.30(OTS).

An IBM 650 program is given for the computation of neutron energy spectra in homogeneous reactors moderated by heavy or by light water. (auth)

12885 HW-46781

General Electric Co. Hanford Atomic Products Operation, Richland, Wash.

SIZING OF A THREE PIECE CYLINDRICAL FUEL ELEMENT FOR THE PLUTONIUM RECYCLE PROGRAM REACTOR. W. S. Figg. Nov. 21, 1956. Decl. Aug. 22, 1957. 12p. Contract [W-31-109-Eng-52]. $3.30(ph OTS); $2.40(mf OTS).

Calculations were made to determine the dimensions of a fuel element, consisting of concentric UO_2 cylinders, for the Plutonium Recycle Program Reactor. The design resulting from these calculations is shown. Necessary equations are also developed. (L.T.W.)

12886 HW-51175

General Electric Co. Hanford Atomic Products Operation, Richland, Wash.

RE-EVALUATION OF GRAPHITE DIFFUSION LENGTHS. M. T. Lee. June 5, 1957. 22p. Contract [W-31-Eng-52]. $0.25(OTS).

The measured values of diffusion length in five Hanford Production Pile moderators and of the Standard Pile, a graphite stack, were corrected for neutron absorption in the Al process tubes, atmospheric N in the machined openings of the pile, N in the graphite pores, for neutron streaming in voids, and for density of the graphite, to reduce them to diffusion lengths of equivalent solid stacks of graphite of 1.6 gm/cc density for comparison purposes, the average value being 52.19 cm. In these corrections a revised value of the macroscopic thermal absorption cross section of reactor grade Al of 0.0145 cm^{-1} was used, and a revised microscopic transport cross section of graphite of 4.95 b. Using this value we find an apparent thermal absorption cross section of C of 3.748×10^{-3} b at 2200 m/sec. (auth)

12887 HW-51398

General Electric Co. Hanford Atomic Products Operation, Richland, Wash.

SIMULATION OF THE KINETIC BEHAVIOR OF THE PRPR. H. H. Burley. July 16, 1957. 31p. Contract [W-31-109-Eng-52]. $6.30(ph OTS); $3.00(mf OTS).

The kinetic behavior of the Plutonium Recycle Program reactor was studied to determine if any plausible disturbance in reactivity would constitute a hazard to the reactor. The delayed neutron circuit, the metal temperature circuit, and, in some cases, the reactivity contribution from the moderator dump system was simulated. The reactor response to step inputs of reactivity (δ K) and to controlled rates of reactivity input was then recorded. (auth)

12888 IDO-16373

Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.

MTR TECHNICAL BRANCH QUARTERLY REPORT FOR FIRST QUARTER, 1957. W. B. Lewis, ed. July 1, 1957. 53p. Contract AT(10-1)-205. $0.35(OTS).

The preliminary design was completed of a shim rod magnet to replace the magnets now in the MTR. Studies were made on normal charge lives of the MTR and on the problems accompanying off-brand fuels. Improved means for measuring gamma heating and neutron flux were developed. The fuel element development program ran hydraulic and static tests on fuel elements. Further studies were made on an indium loop as a gamma source. Static and kinetic studies on the SPERT Reactor continued. Fission product transients and reactivity changes in Th slugs were measured in the RMF. The cross section program continued to produce valuable data with emphasis on the U^{233} program. Preliminary work and design studies were started in the inelastic scattering program. Analysis of MTR irradiated Be for Be^{10}, purification of a sample of U^{233}, and resonance and thermal flux monitors were studied. (For preceding period see IDO-16331.) (W.L.H.)

12889 IDO-16375

Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.

HAZARDS ASSOCIATED WITH THE OPERATION OF THE MTR AT 40 MW. D. R. deBoisblanc, M. H. Bartz, F. L. McMillan, H. L. McMurry, J. H. Rainwater, and M. E. Thomas. July 27, 1955. Decl. Aug. 13, 1957. 14p. Contract AT(10-1)-205. $3.30(ph OTS); $2.40(mf OTS).

Hazards associated with elevation of the operating power of the Materials Testing Reactor to 40 Mw are surveyed. Reactivity requirements, cooling considerations, structural stability, effluent activity, control considerations, and shielding are discussed. It was concluded that operation of the MTR at 40 Mw would not be greatly different from operation at 30 Mw. (See also IDO-16340.) (C.H.)

12890 IDO-16383

Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.

STABILITY TESTS WITH THE SPERT-I REACTOR. F. Schroeder. July 1, 1957. 13p. Contract AT (10-1)-205. $0.20(OTS).

The existence of unstable behavior in the SPERT-I reactor has been previously reported. Recent tests, in which the conditions for the onset of this instability were investigated, are discussed. Tests were conducted with the initial bulk water temperature at 20 and 97°C (boiling), and with the initial height of the water head over the core at 2 and 9 feet. The reproducibility of all such stability tests is discussed. (auth)

12891 IDO-28002

Aerojet General Co., Azusa, Calif.

POLPHENYL-COOLANT BURNOUT STUDIES. Monthly Progress Report No. 8 [for] June 16 through July 15, 1957. K. Sato. Aug. 9, 1957. 22p. Contract AT(04-3)-44. (AGC-L2917-8). $4.80(ph OTS); $2.70(mf OTS).

Studies were conducted to determine whether polyphenyl compounds, such as Santowax-R, or other terphenyl compounds, are suitable as heat-transfer fluids in organic-moderated reactors. The maximum allowable heat flux to the fluid will be established experimentally by determining the heat-flux rate at the beginning of film-boiling for various pressures, fluid velocities, and fluid temperatures. (For preceding period see IDO-28001.) (auth)

12892 KAPL-M-BES-3

Knolls Atomic Power Lab., Schenectady, N. Y.

THEORY OF PULSED NEUTRON REACTIVITY MEASUREMENTS IN HETEROGENEOUS REACTORS. B. E. Simmons. July 8, 1957. 5p. Contract W-31-109-Eng-52. $1.80(ph OTS); $1.80(mf OTS).

A simple interpretation is given of a time-independent multigroup equation which predicts the flux decay constants measured by the pulsed neutron method. (auth)

12893 KAPL-M-TWT-1

Knolls Atomic Power Lab., Schenectady, N. Y.

HYDRAULIC FLOW TRANSIENTS. Thomas W. Trout. July 15, 1957. 24p. Contract W-31-109-Eng-52. $4.80 (ph OTS); $2.70(mf OTS).

The transient flow for total loss of pump power in an "m" loop hydraulic system is calculated on the analog computer. The principal assumptions are that the stored energy in the motor, pump and fluid are dissipated in the hydraulic loop and the impeller; however, an approximation is given which includes the energy dissipation in the motor air (fluid) gap. Further, the results are based on assumed typical pump characteristics. Flow transient curves are presented that give the decay time to any value of flow if the following system parameters are known at rated conditions: loop flow, loop pressure drop, length to cross-sectional area ratios, pump speed, fluid density, hydraulic efficiency and the moment of inertia of the pump. The curves illustrate the manner in which system parameters must be varied to obtain a specified decay time. (auth)

12894 KAPL-M-WBW-3

Knolls Atomic Power Lab., Schenectady, N. Y.

MEASUREMENTS OF WATER GAP PEAKING IN THE TTR PRESSURE VESSEL. W. B. Wright. June 20, 1957. 41p. Contract W-31-109-Eng-52. $6.30(ph OTS); $3.00 (mf OTS).

Measurements of flux peaking near plane water gaps were made at room temperature and at 530°F. By qualitative arguments, it is shown that the low values obtained at both temperatures may be attributed to a large spectrum effect peculiar to the experimental arrangement. An attempt was made to evaluate this effect with the result that the modified calculations are in fair agreement with the experimental values. Other than constant flux distributions are considered analytically, and it is shown that in regions of reasonable buckling, flux peaking is essentially given by the expressions derived for a slab gap imbedded in an infinite core. The accuracy of the diffusion theory approximation is examined by comparison with a P_3 calculation and it is shown that the correction supplied by the more exact treatment is on the order of 1%. (auth)

12895 NAA-SR-1936

Atomics International Div., North American Aviation, Inc., Canoga Park, Calif.

ORGANIC MODERATED REACTOR RESEARCH AND DEVELOPMENT PROGRAM. Quarterly Progress Report [for] January–March 1957. E. F. Weisner, ed. Sept. 1, 1957. 54p. Contract AT-11-1-GEN-8. $0.40(OTS).

Studies associated with the development of a large organic moderated reactor are reviewed. Further investigations were made of the heat transfer and coolant flow characteristics of matrices made up of pin- and plate-type elements. Elements aligned both parallel and perpendicular to the flow were considered. Reactor shielding requirements were calculated assuming the use of ordinary and heavy concrete, Fe, and Pb. Rod drop characteristics were calculated to establish the criteria for dynamic stability and over-all safety. (D.E.B.)

12896 NP-6414

Allstates Design and Development Co., Inc., Trenton.

TRANSIENT ANALYSIS OF EMERGENCY COOLING SYSTEMS FOR SUBMARINE NUCLEAR REACTORS. H. A. Harrington, K. E. Korn, D. B. Pierson, and W. A. Verrochi. [1957]. 129p. For Westinghouse Electric Corp. Bettis Plant. Contract NObs-67500, Subcontract 73-(00-832).

In the event of a loss of coolant flow accident in a submarine nuclear power plant, decay heat from the reactor is removed by natural convection in an emergency cooling loop and exchanged to the sea. Bends in emergency cooling system piping limit the ship's attitudes at which convection flow will start. Computer analyses were made to evaluate these limits. (D.E.B.)

12897 NP-6428

Mine Safety Appliances Co., Callery, Penna.

PROGRESS REPORT 41 FOR JUNE AND JULY 1957. W. J. Posey, ed. Aug. 15, 1957. 15p. Contract NObs-65426.

(For preceding period see NP-6260.)

12898 ORNL-2331

Oak Ridge National Lab., Tenn.

HOMOGENEOUS REACTOR PROJECT QUARTERLY PROGRESS REPORT FOR PERIOD ENDING APRIL 30, 1957. Sept. 3, 1957. 196p. Contract W-7405-eng-26. $1.00(OTS).

Homogeneous Reactor Test. Distilled water runs and a UO_2SO_4 run were made, and the performance of the chemical plant and the cracking of the flanges and some leak detector lines were investigated. Simulated remote-maintenance operations are described. Brief reports of design changes, component development, and controls and instrumentation work are made, and data from operation of the HRT chemical plant are given. Reactor Design and Analysis. Conceptual design of HRE-3 was initiated. Fuel costs were computed for 2-region aqueous homogeneous reactors containing $U^{233}-D_2O$ slurry in core and blanket, with and without ThO_2. Fuel costs for 1-region reactors operating in non-steady-state conditions, and thermal fluxes and power densities for several multiregion research reactors were also calculated. Engineering Development. Work on development of fuel system components and reactor slurry systems continued. Reactor Materials Research. The corrosive effects of UO_2SO_4 solutions on stainless steel as affected by $BeSO_4$, loop history, Cl^- and Br^- concentrations, and pertechnetate plus Cl^- concentrations were investigated. Other corrosion studies reported are: corrosion by boiler water of carbon steel, stainless steel, Nb, Ti, and Zircaloy-2; corrosion of Zr-base alloys with Si, Cr, Mo, Ni, Nb, and V by reactor solution; attack of Stellite-6 by HNO_3; porosity of Au-plate on stainless steel; and corrosion of Al_2O_3 and TiO_2 by UO_2SO_4 solution. Slurry corrosion studies with ThO_2 slurries in loops and toroids are described. Radiation corrosion experimental equipment and experiments are described. The corrosion of Zr, Ti, steel, stainless steel, and Zircaloy-2 in in-pile loops was studied. Metallurgy studies were conducted on hardness-time-temperature curves for Zr–Nb, Zr–Nb–Fe, and Zr–Nb–Pd alloys; absorption of H_2 on cold-worked iodide Zr and Ti; anisotropy in impact properties of Zircaloy-2; brittle failures in HRP flange test loop; development of an internal-probe eddy-current tubing inspection device; and welding techniques for making root pass in stainless steel-Ti weldments. Chemical Engineering Development. Studies conducted in fuel processing included: growth of reactor solids particles containing 40% Fe_2O_3; radiation stability of iodate vs. H_2 to O_2 ratio; UO_2SO_4 processing by UO_4 ± precipitation; solubility of Kr in UO_2SO_4 solution and in water; and ZrO_2 deposition in a circulating loop vs. temperature, flow rate, and ZrO_2 concentration. Uranyl sulfate blanket processing studies of Pu solubility in UO_2SO_4 solution are described, and some ThO_2 blanket studies are briefly reported. The development of ThO_2 slurries continued. (For preceding period see ORNL-2272.) (T.R.H.)

12899 RPI-12(AECL)

Atomic Energy of Canada Ltd. Chalk River Project, Chalk River, Ont.

REACTIVITY AND FUEL BALANCE IN RECYCLED PLUTONIUM REACTORS. M. F. Duret. Oct. 24, 1955. 30p.

Equations are developed for expressing the nuclear characteristics of reactor cores containing natural U,

recycled Pu, and up to three stages of depleted U. The initial reactor charge would be natural U which is processed for Pu and fission product removal as reactivity demands. Both the depleted U and separated Pu are recharged to the reactor. Depleted U would be discarded when Pu^{240} concentrations became excessive. (D.E.B.)

12900 TID-3506(1st Rev.)
Technical Information Service Extension, AEC.
UNCLASSIFIED U.S. ATOMIC ENERGY COMMISSION REPORTS ON CONTROLLED THERMONUCLEAR PROCESSES. A Literature Search. Sidney F. Lanier, comp. Sept. 1957. 8p. $0.50(OTS).

This revision contains 55 references dealing largely with the motion of highly ionized plasma in magnetic and electric fields. (M.H.R.)

12901 TID-7539
Division of Reactor Development. Maritime Reactors Branch, AEC and Maritime Administration, Washington, D. C.
NUCLEAR-POWERED SHIPS FOR AMERICAN SHIP OPERATORS. A Symposium Held at Washington, D. C., July 30, 1957. 196p. $5.50(OTS).

Fifteen papers presented at the Washington symposium are included. Marine applications of nuclear power are discussed with regard to maritime regulations and marine insurance. The designs of the first nuclear merchant vessel and its pressurized water reactor are given. Other reactor designs proposed for merchant ship applications are boiling water, organic moderated, and gas cooled reactors. (D.E.B.)

12902 WAPD-PA-169
Westinghouse Electric Corp., Atomic Power Div., Pittsburgh.
MEANS TO PROLONG FLOW COASTDOWN. T. J. Walker. May 31, 1955. 14p. Contract AT 11-1-GEN-14. $3.30(ph OTS); $2.40(mf OTS).

12903 WAPD-TM-66
Westinghouse Electric Corp Bettis Plant, Pittsburgh.
ANALYSIS OF A NEW METHOD FOR REGULATING PRESSURE IN A POWER REACTOR. W. R. Campbell. June 1957. 30p Contract AT-11-1-GEN-14. $4.80(ph OTS); $2.70(mf OTS).

A method of controlling system pressure in a reactor by means of a pressurizer that does not use electric heaters is analyzed. The new arrangement has a centrifugal pump to bias the system pressure above that in the pressurizer and controls the pressure during transients by varying the rotor speed of the bias pump. Because of its fast response to changes in the control variable, the bias pump pressurizer provides the tight pressure control needed in a steam rod reactor. Results of simulating this pressurizer with a power reactor having the high pressure coefficient of reactivity experienced in the steam rod reactor are shown, and the influences of each of the design variables on these results are discussed. (auth)

12904
CALCULATION OF THE MULTIPLICATION FACTORS OF DOUBLE GRID FUEL ELEMENTS. H. Engel. Atomkern Energie 2, 168-76(1957) May. (In German)

12905
ORGANIC COMPOUNDS AS MODERATORS AND COOLANTS IN NUCLEAR REACTORS. Sigurd Rösinger. Atomkern Energie 2, 176-81(1957) May. (In German)

12906
DEPENDENCE OF PERFORMANCE OF GAS COOLED NUCLEAR REACTORS ON THE COOLING GAS PRESSURE AND THE REACTOR DIMENSIONS. Alfred Schraud. Atomkern Energie 2, 204-7(1957) June. (In German)

12907
THE CORROSION PROBLEM IN AN ATOMIC REACTOR WITH HIGH TEMPERATURE WATER. Willibald Machu. Atomkern Energie 2, 207-13(1957) June. (In German)

By the use of water as coolant and moderator in atomic reactors, a step nearer is made to solution of the numerous physical, chemical, metallurgical, and engineering problems, especially corrosion stability of fuel, its shielding, and the use of reactor construction materials. (tr-auth)

NUCLEAR TRANSFORMATION

12908
THE PHOTOPROTONS EMITTED FROM CARBON AND NITROGEN NUCLEI. D. L. Livesey (Queen's Univ., Kingston, Ontario). Can. J. Phys. 35, 987-94(1957) Sept.

The photoprotons from carbon have been studied by exposing propane gas to bremsstrahlung of maximum energy 35 Mev and recording the charged particles produced in photographic plates. The energy distribution displays a peak near 6.0 Mev which is related to the position of the dipole resonance in C^{12} nuclei. The angular distribution of protons near the peak energy agrees closely with a function $f(\theta) = A + B\sin^2\theta$, but at higher energies most of the protons are emitted at forward angles. Nitrogen gas has also been bombarded with bremsstrahlung of maximum energies 30 and 70 Mev. The energy distributions of the photoprotons are interpreted in terms of known reactions in the N^{14} nucleus. (auth)

12909
STUDY OF THE $Cu^{65}(p,n)Zn^{65}$ REACTION BY CONVERSION ELECTRONS. E. M. Bernstein and H. W. Lewis (Duke Univ., Durham, N. C.). Phys. Rev. 107, 737-40(1957) Aug. 1.

A magnetic beta-ray spectrometer has been used to study the prompt internal-conversion electrons from low-lying states of Zn^{65} excited by the $Cu^{65}(p,n)Zn^{65*}$ reaction. The data show that there are levels in Zn^{65} at 54 ± 2, 119 ± 2, and 209 ± 3 kev, all levels being excited directly by the p-n reaction. The threshold for exciting the 54-kev level is (2223^{+2}_{-3}) kev, yielding a Q value of $-(2189^{+2}_{-3})$ kev for the reaction to this level. Neutron branching ratios were calculated from the relative yields of conversion electrons. At a bombarding energy of 3.75 Mev the ratios are 1:8:4 for the neutrons leading to the 54-, 119-, and 209-kev levels, respectively. (auth)

12910
COMPARATIVE YIELDS OF (γ,2n) AND (γ,pn) PROCESSES FOR Fe^{54} INDUCED BY 70-Mev BREMSSTRAHLUNG. Raymond M. Henry and Don S. Martin, Jr. (Iowa State Coll., Ames). Phys. Rev. 107, 772-4(1957) Aug. 1.

Relative yields of $Fe^{54}(\gamma,2n)Fe^{52}$: $Fe^{54}(\gamma,pn)Mn^{52}$: $Fe^{54}(\gamma,pn)Mn^{52m}$ were found to be 1:8:19 for irradiations by 70-Mev bremsstrahlung. These yields were compared with yields of the same products by alpha-particle bombardment, and results were discussed in terms of a statistical model for the reactions. (auth)

12911
DELAYED NEUTRONS FROM 15.5-sec Br^{88}. Gilbert J. Perlow and Andrew F. Stehney (Argonne National Lab., Lemont, Ill.). Phys. Rev. 107, 776-80(1957) Aug. 1.

A description is given of a gas-flow system which permits quick chemical isolation of bromine fission fragments. By use of this system, Br^{88} was found to be a delayed-neutron precursor resulting from the fission of U^{235}. The half life measured by neutron counting is 15.5 ± 0.4 sec, in agreement with that previously measured for Br^{88} by radiochemical techniques. It is a relatively abun-

dant source of delayed neutrons, producing per fission 3.5 ± 1.5 times the number of neutrons in the 54-sec group having Br^{87} as a precursor. Br^{88} is the first definitely established case of a delayed-neutron precursor of odd proton and odd neutron number. Qualitative arguments are given to show that such nuclei are about as likely to be delayed-neutron precursors as are those of odd Z and even N, although only the latter have been reported previously. (auth)

12912

d-D REACTIONS AT 6- TO 14-Mev INPUT ENERGY. J. E. Brolley, Jr., T. M. Putnam, and Louis Rosen (Los Alamos Scientific Lab., N. Mex.). Phys. Rev. 107, 820-4(1957) Aug. 1.

Differential cross sections for both branches of the d-D reaction have been obtained over the input energy interval 6 to 14 Mev by charged particle measurements utilizing a nuclear multiplate camera. Legendre expansions are given which permit interpolation of the data over both energy and angle. (auth)

12913

NEUTRON EMISSION PROBABILITIES FROM THE INTERACTION OF 14-Mev NEUTRONS WITH Be, Ta, AND Bi. Louis Rosen and Leona Stewart (Los Alamos Scientific Lab., N. Mex.). Phys. Rev. 107, 824-9(1957) Aug. 1.

The spatial and spectral distributions of the neutrons from 14-Mev neutron interactions with Ta and Bi have been obtained by using nuclear emulsion detectors in conjunction with a neutron collimator. These results indicate that roughly 85 to 90% of the interactions proceed via compound-nucleus formation while approximately 10 to 15% proceed by "direct" interactions. The space-integrated neutron spectrum has been obtained for Be by means of a sphere experiment. Cross sections for neutron emission, nonelastic scattering, (n,n′), and (n,2n) are derived for all three elements. (auth)

12914

EVIDENCE OF A SECOND MAXIMUM IN THE CROSS SECTION FOR FAST PHOTONEUTRON EMISSION IN Cr, As, I, Ta. F. Ferrero, R. Malvano, and C. Tribuno. Nuovo cimento (10) 6, 385-6(1957) Aug.

12915

MULTIPLE EMISSION IN NUCLEAR REACTIONS. A. Tomasini. Nuovo cimento (10) 6, 404-7(1957) Aug.

An excited nucleus is generally supposed to go to the ground state through a succession of elementary processes in which only one particle at a time is emitted. While this is clear at low excitation energy, it seems that at higher energy two or more particles can be emitted at the same time, in such a way that they will be correlated. Calculations are made considering only heavy nuclei and supposing that a statistical theory is valid. (M.H.R.)

PARTICLE ACCELERATORS

12916 AECU-3512

Purdue Research Foundation, Lafayette, Ind.
BASIC RESEARCH WITH HIGH ENERGY ELECTRONS AND X-RAYS PRODUCED BY A 300 MEV SYNCHROTRON. Progress Report No. 5. June 15, 1957. 23p. Contract AT(11-1)-123.

The Purdue electron synchrotron has been used in the extension of studies on photomeson production, photoproton emission, and photonuclear reactions leading to emission of delayed neutrons. Further development has been carried out on plastic scintillators and associated detection equipment. To increase energy resolution and make possible more precise experiments, a 120° double-focusing spectrometer magnet has been ordered. A series of experiments is being planned around the spectrometer. The synchrotron has continued to operate satisfactorily at a peak energy of the order of 345 Mev and peak beam intensity of 4×10^7 Q per pulse at 320 Mev. Development of a plastic donut continues satisfactorily and other modifications to the machine have been made such as installation of new pole shims, a new "N" coils, and a second "broom" magnet. (For preceding period see COO-178.) (auth)

12917 MURA-362

Midwestern Universities Research Assn., Madison, Wis.
THE $\nu = \frac{1}{3}$ N NON-LINEAR RESONANCE OF A FIXED FIELD ACCELERATOR. G. Parzen. June 8, 1957. 19p. Contract AT(11-1)-384. $4.80(ph OTS); $2.70(mf OTS).

The problem of finding the stability limits, due to the $\nu = \frac{1}{3}$ N non-linear resonance in the radial motion, of an accelerator having an arbitrary magnetic field is discussed. The general spiral sector machine is treated in detail. The results of the theory are compared with numerically computed results. (auth)

12918

LINEAR THEORY OF SYNCHROTRON OSCILLATIONS. II. PARTICLE LOSSES DURING ACCELERATION AND TOLERANCE THEORY. L. L. Goldin and D. G. Koškarev (Academy of Sciences of the U.S.S.R., Moscow). Nuovo cimento (10) 6, 286-98(1957) Aug.

Various types of synchrotron oscillation perturbations of accelerated particles are examined from the standpoint of the particle losses they produce. A system of tolerances for a prescribed particle loss is set up. (auth)

12919

A METHOD OF INVESTIGATION OF RADIAL-PHASE OSCILLATIONS OF ELECTRONS IN A SYNCHROTRON. Iu. M. Ado (Academy of Sciences, USSR). Soviet Phys. JETP 4, 437-9(1957) Apr.

12920

INVESTIGATIONS OF ELECTRON CAPTURE IN A BETATRON. Yu. S. Korobochko (Kalinin Leningrad Polytechnic Inst.). Zhur. Tekh. Fiz. 27, 1603-5(1957) July. (In Russian)

The mean number of electron revolutions in the operating zone of a 15 Mev betatron and the magnitude of the current circulating in the orbit during capture were measured. The effectiveness of electron capture in various areas of pulse injections was estimated. (R.V.J.)

RADIATION ABSORPTION AND SCATTERING

12921

THE HIGH ENERGY LIMIT OF THE POTENTIAL SCATTERING. I. NON RELATIVISTIC KINEMATICS. M. Verde. Nuovo cimento (10) 6, 340-54(1957) Aug.

Some asymptotic expansions of the phase shifts have been derived, corresponding to high energies and a non relativistic potential scattering. They are valid for small as well as large values of the angular momenta and are obtained using the Gel'fand and Levitan operator which gives a uniform connection of two complete bases in the Hilbert space. An approximation of the total scattering amplitude is also presented, whose validity extends to all angles of scattering with the exception of the vicinity of 180°. Some remarks are made on the problem of obtaining the potential from the knowledge of the phase shifts for a fixed energy as function of the impact parameter. (auth)

12922

ELASTIC PROTON-PROTON SCATTERING AT 2.24, 4.40, AND 6.15 Bev. Bruce Cork and William Wenzel (Univ. of California, Berkeley) and Charles W. Causey, Jr. (U. S.

Naval Postgraduate School, Monterey, Calif.). Phys. Rev. 107, 859-67(1957) Aug. 1.

Protons of the internal circulating beam of the Bevatron were scattered in a polyethylene target. Both scattered and recoil protons were detected by scintillation counters at angles which define elastic proton-proton events. An internal counter was located within a few inches of the beam to permit measurements at laboratory scattering angles as low as 2°. Absolute values are based on the calibration of the induction electrode that monitors the circulating beam. Total elastic cross sections obtained by integrating the differential spectra are 17, 10, and 8 mb at 2.24, 4.40, and 6.15 Bev, respectively. The experimental angular distributions are consistent with the prediction of a simple optical model with a complex index of refraction at short range. (auth)

12923

UNIQUENESS OF SOLUTIONS TO DISPERSION RELATIONS FOR POTENTIAL SCATTERING. Stephen Gasiorowicz and Malvin A. Ruderman (Univ. of California, Berkeley). Phys. Rev. 107, 868-70(1957) Aug. 1.

Some properties of the dispersion relations for potential scattering are examined. It is shown that even for a potential of finite extent, the dispersion and unitarity relations do not define a unique scattering amplitude, so that they do not contain all the information that is derivable from the Schrödinger equation. (auth)

12924

FORMULATION OF HIGH-ENERGY POTENTIAL SCATTERING PROBLEMS. David S. Saxon (Inst. of Theoretical Physics, Copenhagen). Phys. Rev. 107, 871-6(1957) Aug. 1.

A method is presented for treating high-energy potential scattering in which the zero-order result is essentially the WKB approximation. The correction terms which appear involve the rate of change of the local wave number and the curvature of the classical trajectory. Unlike the usual WKB procedure which is only asymptotically correct, the formulation remains exact, but not necessarily convenient, even if the corrections are large. The improvement over the WKB approximation is demonstrated explicitly for one-dimensional scattering and for the calculation of phase shifts for scattering from a central potential. It is also shown that this prescription reduces to the Born approximation when the conditions for the validity of that approximation are satisfied. Thus the proposed formulation contains both the WKB and Born approximations as simple limiting cases. (auth)

12925

STATE SPACES IN SCATTERING THEORY. E. L. Hill. (Univ. of Minnesota, Minneapolis). Phys. Rev. 107, 877-83 (1957) Aug. 1.

Earlier work on the definition of state spaces for a particle in quantum-mechanical theory is extended to the case of scattering in a Coulomb field. The existence of the Fock-Bargmann symmetry group for this field leads to separability of the Schrödinger equation in parabolic coordinates, which in turn allows one to define the parabolic-wave state space for a particle. A discussion is given of the WKB limit in scattering problems. (auth)

12926

THEORY OF DIFFUSE SCATTERING OF X-RAYS BY SOLID SOLUTIONS. I. M. A. Krivoglaz (Academy of Sciences, Ukrainian SSR). Soviet Phys. JETP 4, 293-302 (1957) Apr.

The intensity of the diffuse scattering of x rays by mixed crystals has been determined by means of a phenomenological treatment. Thermodynamic quantities which may be found from other experiments appear in the expressions for the background intensity. Characteristic features of the scattering in the neighborhood of points of phase transitions of the second kind and of critical points on the dissociation curve have been investigated, and also the scattering by weak, by ideal, and by almost completely ordered solid solutions has been examined. (auth)

12927

INELASTIC SCATTERING OF PHOTONS BY INDIUM-115 NUCLEI. O. V. Bogdankevich, L. E. Lazareva, and F. A. Nikolaev (Academy of Sciences, USSR). Soviet Phys. JETP 4, 320-7(1957) Apr.

The yields of the reactions $In^{115}(\gamma,\gamma')In^{115m}$ and $In^{115}(\gamma,2n)In^{113m}$ and the yield of neutrons accompanying the photodisintegration of In were measured at various maximum energies of x rays from 5 to 27 Mev. Cross sections were calculated by the photon difference method. (auth)

12928

POLARIZATION OF 660 Mev PROTONS SCATTERED BY NUCLEI. M. G. Meshcheriakov, S. B. Nurushev, and G. D. Stoletov (Academy of Sciences, USSR). Soviet Phys. JETP 4, 337-45(1957) Apr.

Results of experiments on double scattering of 660 Mev protons are described. The angular dependence of the asymmetry was measured in scattering of polarized 565 and 635 Mev protons from Be. The polarization in quasi-elastic p–p scattering at 635 Mev was measured by the method of coupled telescopes. The results of the measurements are given for the asymmetry in scattering of protons at 9° from C, Al, Pb, and Bi and a detection limit of 230 and 620 Mev. (auth)

RADIATION EFFECTS

12929 HW-51362

General Electric Co. Hanford Atomic Products Operation, Richland, Wash.

A METHOD FOR THE EVALUATION OF RADIATION DAMAGE TO THE MECHANICAL PROPERTIES OF PLASTICS. [Paper Presented at] Radiation Technology Symposium [held at] General Engineering Lab. [on] May 21, 22, 23, 1957. J. H. Kleinpeter. 9p. Contract W-31-109-Eng-52. $1.80(ph OTS); $1.80(mf OTS).

A flex test machine is described for measuring radiation damage in plastic materials. The machine is essentially a sample holder which is mounted so that it is pivoted about a line which lies in the plane of its upper surface. Samples are damped onto this sample holder by means of a hold-down bar in such position that they cantilever over the edge. The outer end of the sample is restrained above and below. If the sample holder is tilted from the horizontal in either direction, the sample is caused to deflect an amount which is proportional to the angle of tilt of the sample holder. If the vertical movement of the edge of the sample holder is measured, it is easy to calculate the amount the end of the sample would move were it not restrained. Since it is restrained, this amount is the deflection of the free end of the sample. Measurements are made on the effect of γ exposure on flex life and modulus of elasticity of polyethylene. (L.T.W.)

12930 IGR-TN/C-651

Gt. Brit. Culcheth Labs., Culcheth, Lancs, England.

IRRADIATION OF STEELS. T. J. Heal. Aug. 1957. 12p.

The effects of neutron irradiation on the properties of steels to be used in reactor construction are described, and suggestions for the modification of the present irradiation programs in the light of recent knowledge are made. (auth)

12931 ORNL-2352

Oak Ridge National Lab., Tenn.

MEASUREMENT OF THE AVERAGE ENERGY LOST BY

A 5 MEV ALPHA PARTICLE IN PRODUCING AN ION PAIR IN WATER VAPOR. W. F. Patton, G. S. Hurst, and T. E. Bortner. Sept. 20, 1957. 55p. Contract W-7405-eng-26. $0.40(OTS).

The W value of water vapor has been determined as 37.6 ± 0.2 electron volts per ion pair. Validity of these measurements is based on the assumption of 100% ion collection. This assumption is valid if all ions are collected before they recombine, but this is still a point of controversy. According to theory, recombination is a function of the angle at which the incident particle traverses the collecting field. Determination of the W value of water vapor were made at angles of 0° and 20° with the same result. It is, therefore, concluded that ion collection was 100% and that the results are valid. (auth)

12932

EXCITATION OF CHARACTERISTIC K X-RAYS FROM ELEMENTS BY PROTONS, DEUTERONS, AND ALPHA PARTICLES. B. Singh (Atomic Energy Dept., Bombay, India). Phys. Rev. 107, 711-15(1957) Aug. 1.

The excitation of characteristic K x rays from Cu and Ag by bombardment of protons, deuterons, and alpha particles has been studied. The charged particles are accelerated by an electrostatic generator, and the resulting characteristic K x rays from thin targets are detected by a proportional counter of good resolution and known efficiency. The counter used can count x rays of energy between 2.0 and 50.0 kev with high efficiency. The pulses from the counter are analyzed by a fifty-channel kick-sorter, and the number of x-ray quanta produced is determined by well-defined differential curves. After correcting for the Auger transition, the absolute cross section for K-shell ionization is measured for the accelerated particles of different energies and compared with the theoretical cross section obtained by using the formula of Lewis, Simmons, and Merzbacher deduced from the theory of Henneberg. (auth)

RADIOACTIVITY

12933 UCRL-3877

California. Univ., Berkeley. Radiation Lab.

NUCLEAR DECAY SCHEMES IN THE ACTINIUM FAMILY (thesis). Richard C. Pilger, Jr. July 1957. 133p. Contract W-7405-eng-48. $21.30(ph OTS); $6.90(mf OTS).

With magnetic alpha-particle and electron high-resolution spectrographs and scintillation gamma-ray spectrometers, a study was made of the nuclear decay of a number of members of the actinium family—U^{235}, Th^{227}, Ra^{223}, Rn^{219}, Po^{215}, and Bi^{211}. Decay schemes are presented for each of these nuclides, together with such correlations as are possible with present theoretical nuclear models. The decay scheme of U^{235} and a portion of that of Th^{227} are interpretable in terms of the collective model and a spheroidal deformation; the decay schemes of Po^{215} and Bi^{211} display spherical shell-model characteristics; however, the intermediate nuclides present complexities not well understood. (auth)

12934

FUNDAMENTAL CONCEPTS OF NUCLEAR PHYSICS. IX. NATURAL RADIOISOTOPES. Werner Braunbek. Atomkern Energie 2, 231-4(1957) June. (In German)

The report on natural radioactivity covers the decomposition, natural decay type and decay energy, radiation, and decay series of natural radioisotopes. (J.E.D.)

12935

A PROPOSED β-DECAY INTERACTION. M. A. Preston (McMaster Univ., Hamilton, Ontario and Univ. of Birmingham, Eng.). Can. J. Phys. 35, 1017-20(1957) Sept.

It is shown that one can retain the two-component neutrino theory and time reversal with scalar and tensor interactions in the β-decay Hamiltonian, if one postulates that the scalar term produces neutrino emission and the tensor term antineutrino emission. This is consistent with all present experimental data. (auth)

12936

K-CAPTURE IN CARBON 11. J. Scobie and G. M. Lewis (Univ. of Glasgow). Phil. Mag. (8) 2, 1089-99(1957) Sept.

K capture in C^{11} has been observed and the K/β^+ ratio found. Comparison with theory leads to a value for the ratio of the Fermi coupling constants. Proportional counters were employed with a gaseous source, and two anticoincidence systems were used, in turn, to reduce wall effects. One made use of a multi-wire ring type counter and the other utilized an envelope of scintillating material coupled to a photomultiplier. The K/β^+ ratio has been determined at $(1.9 \pm 0.3) \times 10^{-3}$ and accords closely with the theoretical value based on the vanishing of interference terms. A comparison shows that the factor b in beta-decay theory, which determines the ratios of decay coupling constants, is (-0.03 ± 0.10). In this decay between mirror nuclei the Fermi matrix element predominates, and the ratio of the two Fermi coupling constants C_v/C_s has been deduced at (-0.02 ± 0.09), from data on the better known Gamow–Teller constants. The pulse height distribution obtained in these experiments showed that little ionization was produced by the nuclear recoil following neutrino emission, though the recoil energy could be comparable with the 180 ev capture x-ray energy. (auth)

12937

PARITY NONCONSERVATION IN β DECAY. Kurt Alder, Berthold Stech, and Aage Winther (California Inst. of Tech., Pasadena). Phys. Rev. 107, 728-36(1957) Aug. 1.

The nonconservation of parity in β decay implies that electrons emitted from unoriented nuclei are polarized along their line of flight. Also, if the β process is followed by a γ radiation, the angular distribution of the γ quantum with respect to the electron direction depends on its circular polarization. Formulas relevant for such experiments as well as for the angular distribution of electrons from oriented nuclei are presented. The results, which include Coulomb corrections, are given for scalar, tensor, and pseudoscalar interactions in the cases of allowed and first-forbidden transitions. The formulas show that an experimental determination of the relative sign of the scalar and tensor coupling constants should be possible. (auth)

12938

IONIZATION FOLLOWING BETA DECAY IN KRYPTON-85. Arthur H. Snell and Frances Pleasonton (Oak Ridge National Lab., Tenn.). Phys. Rev. 107, 740-5(1957) Aug. 1.

Following beta decay in the 9.4-year radioactivity of Kr^{85}, the product rubidium atoms are found to be distributed in the following charge spectrum (figures in percent): charge 1, 79.2 ± 1.0; charge 2, 10.9 ± 2; charge 3, 3.9 ± 0.1; charge 4, 3.1 ± 0.1; charge 5, 1.51 ± 0.07; charge 6, 0.66 ± 0.04; charge 7, 0.40 ± 0.02; charge 8, 0.19 ± 0.02; charge 9, 0.093 ± 0.01; charge 10, 0.026 ± 0.006; charge 11, unobservable. An interpretation is made in terms of the "shaking off" of extranuclear electrons by the sudden change by +1 in the nuclear charge, the intensity of the charge-2 ions being taken as a direct measure of the probability of "shake-off" from the combined 4s and 4p shells. The combined intensities of charge 3 and higher are correspondingly equated to the summed probabilities of primary ionizations in the n = 1, 2, and 3 shells. (auth)

12939

COULOMB EFFECTS IN INNER BREMSSTRAHLEN. R. R.

Lewis, Jr. and G. W. Ford (Univ. of Notre Dame, Ind.). Phys. Rev. 107, 756-65(1957) Aug. 1.

The Coulomb correction to the photon spectrum accompanying beta decay is calculated, treating the Coulomb field as a perturbation. It is shown that for allowed and unique first forbidden transitions, the result differs from that of Knipp-Uhlenbeck-Bloch only by the appearance of an extra factor, related to the Sommerfeld factor in ordinary bremsstrahlen. Analytic formulas are presented for these two selection rules, and a comparison made with recent experiments. (auth)

12940

A CALORIMETRIC DETERMINATION OF THE MEAN ENERGY OF THE β-SPECTRA OF P^{32}, S^{35}, Cu^{64}, W^{185}, AND Au^{198}. N. S. Shimanskaia (Academy of Sciences, USSR). Soviet Phys. JETP 4, 355-8(1957) Apr.

RARE EARTHS AND RARE-EARTH COMPOUNDS

12941 AEC-tr-3038

RADIOACTIVE ISOTOPES OF THE RARE EARTHS FORMED IN A SPALLATION REACTION. G. M. Gorodinskii (Gorodinsky), A. N. Murin, V. N. Pokrovskii (Pokrovsky), B. K. Preobrazhenskii (Preobrazhensky), and N. E. Titov. Translated from Doklady Akad. Nauk S.S.S.R. 112, 405-6(1957). 5p.

A brief summary is given of the results obtained for the γ spectra of fractions of Nd^{140}, Eu^{145} and Eu^{147}, Gd^{147} and Gd^{149}, Yb^{166} and Yb^{169}, Lu^{169}, Dy^{157}, and isotopes of Ce, Tb, Ho, Er, and Tm. (R.V.J.)

SHIELDING

12942

CONCRETE IN RADIATION SHIELDING TECHNIQUE. Thomas Jaeger. Atomkern Energie 2, 217-22(1957) June. (In German)

SPECTROSCOPY

12943

NUCLEAR MAGNETIC RESONANCE SPECTRA OF BORANES. Riley Schaeffer (Iowa State Coll., Ames) and James N. Shoolery and Robert Jones (Varian Associates, Palo Alto, Calif.). J. Am. Chem. Soc. 79, 4606-9(1957) Sept. 5.

Proton and B^{11} nuclear magnetic resonance spectra of B_5H_{11} are presented. The B^{11} spectrum contains sufficient detail to permit an assignment of the peaks to the three types of boron atoms in the molecule. The proton spectrum is complex but by use of the "spin saturation" technique of Bloom and Shoolery, four groups of hydrogens can be observed and related to the molecular structure. Improved spectra have been obtained of both B_5H_9 and $B_{10}H_{14}$ and are correlated with their molecular structures. (auth)

12944

A POLARIZATION METHOD FOR MEASURING THE VELOCITIES OF PARTICLES WITH INTRINSIC MAGNETIC MOMENT. S. G. Kornilov (Saratov State Univ.). Soviet Phys. JETP 4, 444-6(1957) Apr.

THEORETICAL PHYSICS

12945

ON THE FORMULATION OF QUANTIZED FIELD THEORIES. II. H. Lehmann, K. Symanzik, and W. Zimmermann. Nuovo cimento (10) 6, 319-33(1957) Aug.

The concept of causal scattering matrices using retarded multiple commutators of field operators is discussed. (auth)

12946

THE ROLE OF SPIN IN THE RADIATION FROM A "RADIATING" ELECTRON. A. N. Matveev (Moscow State Univ.). Soviet Phys. JETP 4, 409-17(1957) Apr.

It is shown that in the case of energies which are not too great the magnitudes of the spin corrections are of the second order of smallness with respect to the magnitudes of the quantum corrections, while in the case of extreme relativistic energies the spin essentially changes the character of the differential spectrum and the magnitude of the total energy of radiation. (auth)

12947

TWO-NUCLEON POTENTIAL OF INTERMOLECULAR TYPE AND NUCLEAR SATURATION. D. D. Ivanenko and B. K. Kerimov (Moscow State Univ.). Soviet Phys. JETP 4, 417-24(1957) Apr.

A study is made of the statistical model of the nucleus with uniform density distribution of the nucleons, on the basis of a two-nucleon interaction potential of the type of the Lennard-Jones intermolecular potential with a hard barrier. It is shown that saturation can be obtained with a certain choice of the parameters in the potential. (auth)

12948

THE LAGRANGIAN FUNCTION FOR A SYSTEM OF IDENTICALLY CHARGED PARTICLES. V. N. Golubenkov and Ia. A. Smorodinskii. Soviet Phys. JETP 4, 422(1957) Apr.

12949

PHOTOPROTONS FROM A^{40}. A. P. Komar and I. P. Iavor (Academy of Sciences, USSR). Soviet Phys. JETP 4, 432 (1957) Apr.

12950

ON THE DERIVATION OF A FORMULA FOR THE ENERGY SPECTRUM OF LIQUID He^4. L. P. Pitaevskiĭ (Academy of Sciences, USSR). Soviet Phys. JETP 4, 439(1957) Apr.

12951

SPIN-ORBIT INTERACTION IN NUCLEAR MAGNETIC MULTIPOLE RADIATION. D. P. Grechukhin. Soviet Phys. JETP 4, 448-50(1957) Apr.

12952

A DISPERSION RELATION FOR ALL SCATTERING ANGLES. E. S. Fradkin (Academy of Sciences, USSR). Soviet Phys. JETP 4, 450-2(1957) Apr.

URANIUM AND URANIUM COMPOUNDS

12953 AERE-G/M-136

Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.

ELECTRON MICROSCOPE STUDIES OF PARTICLE SIZES AND SHAPE IN URANIUM OXIDE. F. A. Smith and C. S. Lees. June 24, 1952. 21p.

Measurements with the electron microscope of the particle size of a series of UO_2 samples run approximately parallel to those estimated from gas adsorption measurements. The low densities found for certain samples of UO_2 by the helium method may be explained by assuming that the samples in question contain particles which include small voids (only a few Angstroms in size) that are inaccessible to helium or nitrogen. Such spaces would not be visible in the electron microscope. (auth)

12954 AERE-M/R-1497

Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.

PRE-IRRADIATION EXPERIMENTS ON URANIUM–

ZIRCONIUM ALLOYS. C. H. Thomas, E. C. Sykes, P. E. Madsen, and P. C. L. Pfeil. Aug. 16, 1954. Decl. July 16, 1957. 28p.

The changes in the microstructure and hardness of uranium alloys containing 5, 10, and 20 wt. % zirconium have been investigated after various heat treatments. The structure of the alloys rapidly cooled from 850°C breaks up into a fine globular structure of particle size 1 μ or less on tempering below 600°C, but it coarsens on further annealing though only slowly at 450°C. A still coarser globular structure is formed above 600°C, and this increases in size and becomes rod-like on further annealing. These experiments formed the basis on which heat treatment conditions were selected for the enriched uranium–zirconium alloys now being irradiated in the Windscale Piles. A brief comparison is made with the microstructures attainable in uranium–niobium alloys. An account is also given of the procedure used to prepare alloys of enriched uranium and of attempts made to cast small cylinders. (auth)

12955

THE MASS-YIELD CURVE FOR FISSION OF NATURAL URANIUM BY 14-Mev NEUTRONS. J. G. Cuninghame (Atomic Energy Research Establishment, Harwell, Didcot, Berks). J. Inorg. and Nuclear Chem. 5, 1-5(1957).

Relative yields for the fission of natural uranium (effectively U^{238} fission) by 14-Mev neutrons have been measured for mass numbers 89, 91, 99, 111, 115, 140, 143, 144, 147, 153, and 156, and the general shape of the mass-yield curve is given. The peak-to-trough ratio is 9.1; the average number of prompt neutrons emitted per fission is found to be (4 ± 0.5); and a value for the absolute fission yield of Mo^{99} is found to be (5.58 ± 0.56) per cent. The light peak has moved 3 to 4 units towards the heavy peak when compared with the 14-Mev fission of U^{235}. (auth)

12956

THE OCCURRENCE OF THE SHORT-LIVED IODINE ISOTOPES IN NATURAL AND IN DEPLETED URANIUM SALTS. F. T. Ashizawa and P. K. Kuroda (Univ. of Arkansas, Fayetteville). J. Inorg. and Nuclear Chem. 5, 12-22 (1957).

The occurrence of the short-lived iodine isotopes in non-irradiated uranium salts has been established. The equilibrium ratios of the short-lived iodine isotopes to U^{238} in depleted uranium agree, within the experimental error, with the ratios in natural uranium. The ratios expressed in terms of 10^{-4} disintegrations per second per gram of U^{238} are: I^{131}, 0.3 ± 0.1; I^{132}, 2.5 ± 0.3; I^{133}, 1.0 ± 0.2; I^{134}, 3.6 ± 0.4; I^{135}, 3.5 ± 0.4. The following values are obtained for the yields of the iodine isotopes, if Segrè's value for the spontaneous fission half life of U^{238}, $(8.04 \pm 0.3) \times 10^{15}$ years, is taken to be correct: I^{131}, 0.4 ± 0.1; I^{132}, 3.6 ± 0.4; I^{133}, 1.5 ± 0.3; I^{134}, 5.2 ± 0.5; I^{135}, 5.1 ± 0.5 per cent. (auth)

12957

THE CROSS SECTION FOR THE FISSION OF URANIUM BY HIGH-ENERGY PROTONS (140 TO 660 Mev). N. S. Ivanov (Academy of Sciences, USSR). Soviet Phys. JETP 4, 365-7 (1957) Apr.

The thick film method was used to measure the fission cross section of U^{238} by protons of energies 140, 350, 460, and 660 Mev. The probability that uranium will fission when irradiated by protons of a given energy is also obtained. (auth)

12958

URANIUM FISSION INDUCED BY HIGH-ENERGY PROTONS. N. S. Ivanova and I. I. P'ianov (Academy of Sciences, USSR). Soviet Phys. JETP 4, 367-73(1957) Apr.

Uranium fission induced by high-energy protons can be accompanied by the emission of charged particles. The latter can arise from a nuclear cascade process or by evaporation from the excited nucleus. Photographic emulsions were used to analyze the light charged particles accompanying uranium fission induced by protons of various energies (140 to 660 Mev). For incident protons of energies 460 and 660 Mev, experimental data on the knock-on particles emitted from the nucleus during a cascade process were compared with the results of a Monte Carlo calculation. Satisfactory agreement was obtained. The average excitation energies of nuclei about to fission upon being bombarded by protons of energy 140, 350, 460, and 660 Mev were also obtained. (auth)